Heating Piping & Air Conditioning

MAY 1958

Single copy price 75c

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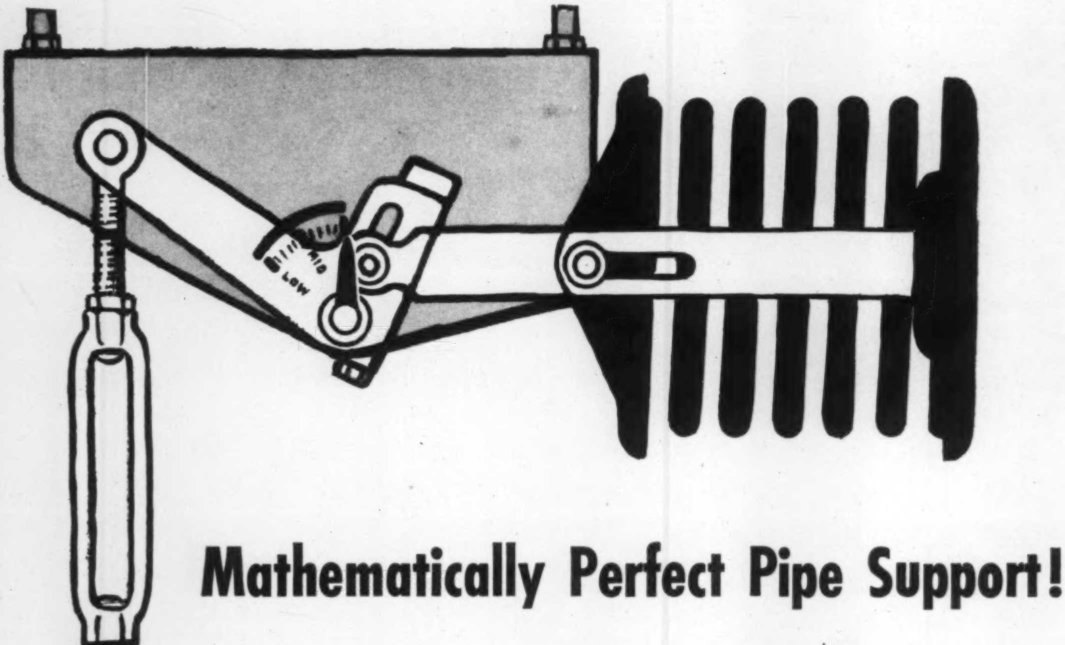
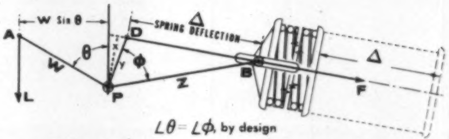


Mathematically Perfect Pipe Support!

The exclusive geometric design of the Grinnell Constant Support Hanger balances the moment of the vertically shifting load with a mathematically equal spring moment at every point throughout the full range of travel.



$\angle\theta = \angle\phi$, by design

$\sin\theta = \sin\phi$

$F = \Delta \times$ spring constant

$L(W \sin\theta) = \frac{YZ \sin\phi}{\Delta}$ F in all positions

$L =$ the spring moment constant, $\frac{YZ \times \text{spring constant}}{W}$

GRINNELL CONSTANT SUPPORT HANGERS

may be adjusted over a 70% range of load carrying capacity, as indicated by the divisions on the load scale. When factory-adjusted to a specified load within this range, there always remains not less than 10% for additional field adjustment.

Compact design, resulting in small size for the load supported, makes Grinnell Constant Support Hangers easy to install—allows their use where only limited head room and space for close nesting are available. Simplicity of design makes these hangers easy to maintain.

Grinnell designs, manufactures and supplies pipe hangers and supports for every piping requirement.

In addition, Grinnell offers the services of trained field representatives and design services for consulting engineering firms. Contact Grinnell for your future hanger requirements.

Only Grinnell Hangers provide true constant support, plus these features:

- 5 frame sizes provide a range of travel from 1½ inches to 12 inches and support loads from 30 to 32,260 pounds.
- Load deflection curve is a horizontal straight line, at every setting on the load adjustment scale.
- Antifriction needle roller bearings are provided at all critical pivot points.
- Low ratio between spring force and supported load reduces friction, permits smaller size hangers for loads carried.
- Travel stop is a permanent attachment — always available for temporary use to set hanger into nonoperative position for underload or overload.

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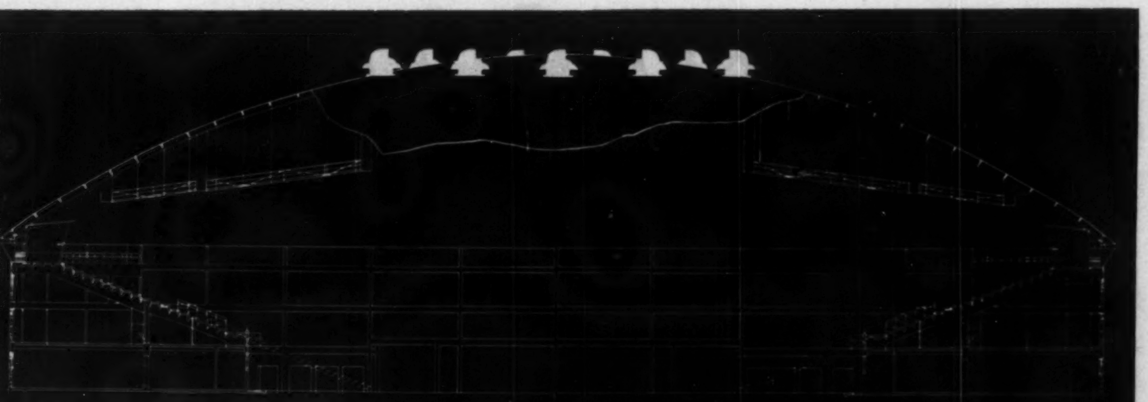

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BOZEMAN, MONTANA
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Willson & Berg, Bozeman, Montana
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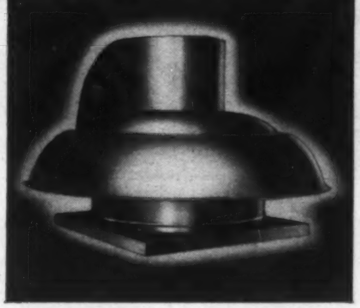
9 DeBothezat Fans selected for new Montana State Fieldhouse *because. . .*



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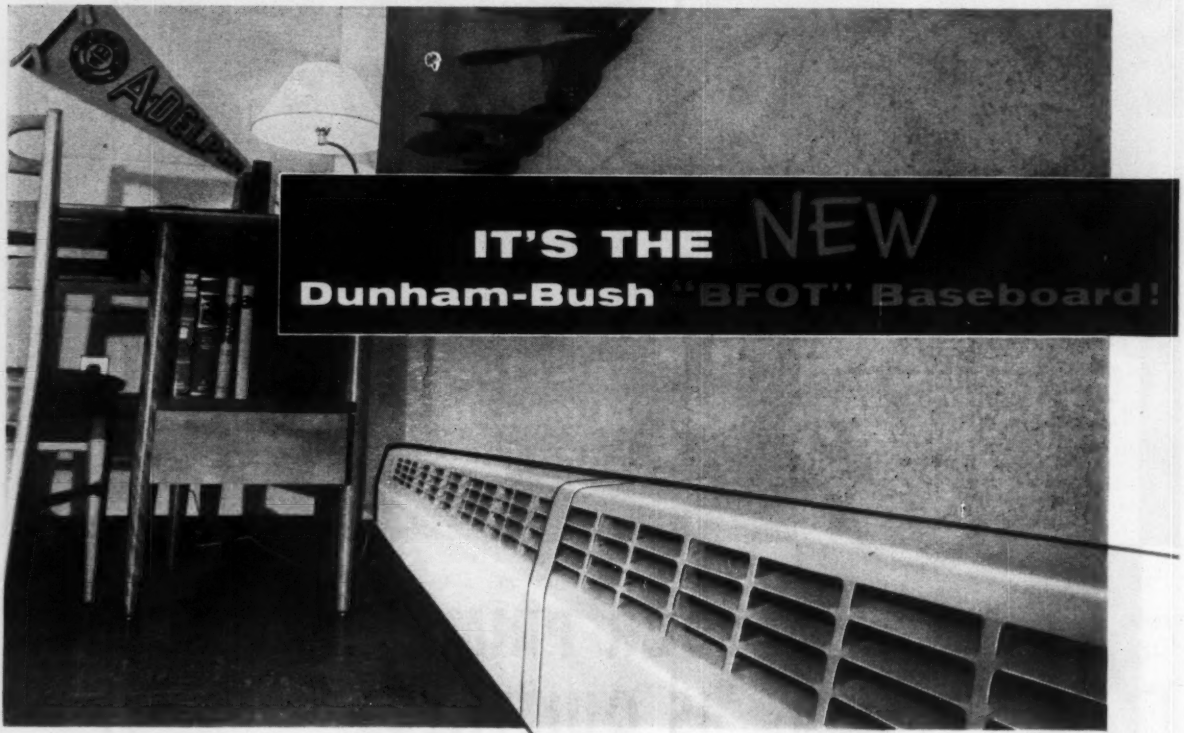

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Heating Piping & Air Conditioning Vol. 30, No. 5

(With which is merged the Aerologist)

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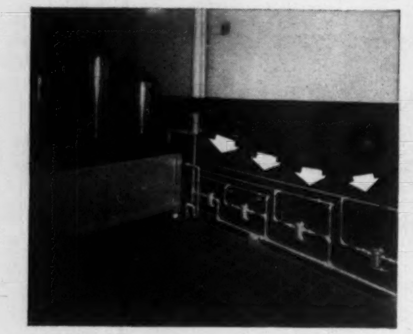
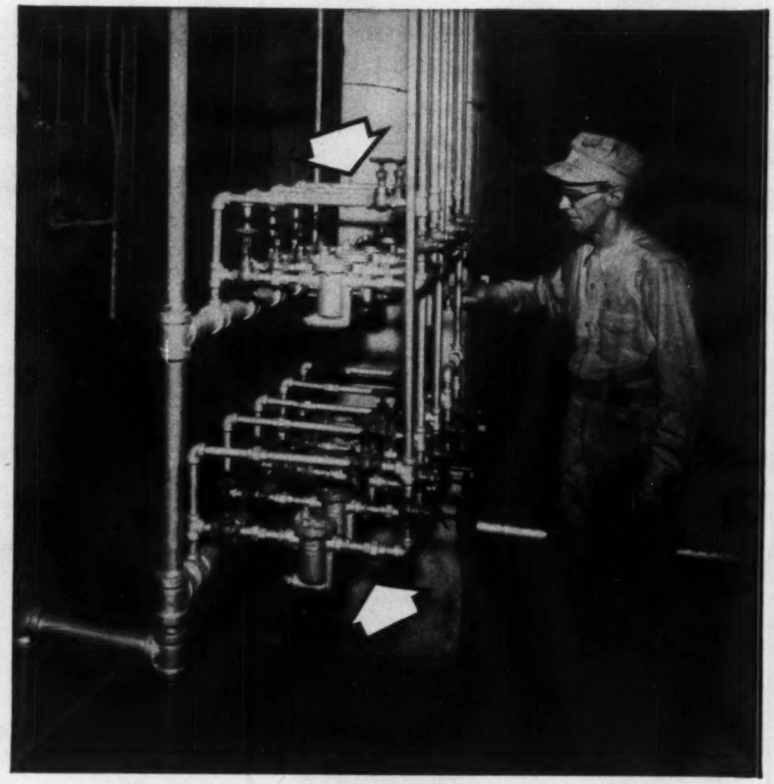
Good Trapping Practice with Good Traps Roy Davis, Maintenance Superintendent, looks over one of the well-engineered Armstrong trap installations he has made at the Masonic Temple in Detroit. Traps discharge to 15" vacuum.

Keeping the Coffee Perkin' with Armstrong traps draining steam heated coffee urns.





Detroit's Masonic Temple Solves Vacuum Loss by Installing Armstrong Inverted Bucket Steam Traps

■ MANY AN engineering hour has been spent ferreting out the leaks in a vacuum return system. Here's a tip if you have the problem: *check your steam traps.* Don't worry about *flash* steam from traps—look for the traps that are leaking *live* steam. Take the case of the big Masonic Temple in Detroit:

The 11,600,000 cubic foot building has banquet space for 4500 persons at a sitting. Imagine the bedlam in the kitchen when the steam heated cooking equipment couldn't meet dinner schedules!—simply because condensate drainage was sluggish. The cooks were always in a stew and calls to the maintenance department were daily occurences.

The building buys 35 lb steam from Detroit Edison. Line pressure is used for the cooking kettles, while regulating stations supply 2 to 3 lb steam for the heating system.

Couldn't Hold Vacuum

Prior to the installation of Armstrong traps, maximum vacuum attainable was 4 inches and in some cases it was necessary to manually drain the systems and dump the condensate.

According to Roy Davis, Maintenance Superintendent, the installation throughout of Armstrong inverted bucket steam traps has solved the problem. "*I don't remember having had the chefs complain since . . . the kettles heat in a hurry now.*"

F. W. Emblin, Operations Manager, adds, "*You can check the vacuum gage any time now and seldom find less than 15" showing.*"

There's another nice part to this story that only time will reveal: Armstrong traps have a habit of delivering this kind of service on low pressure vacuum return systems for years and years without repairs. Your local Armstrong Representative has plenty of cases he can tell you about. Why not call him today?

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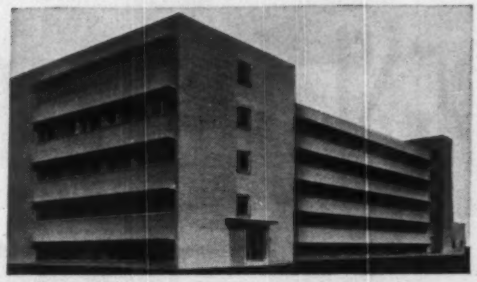
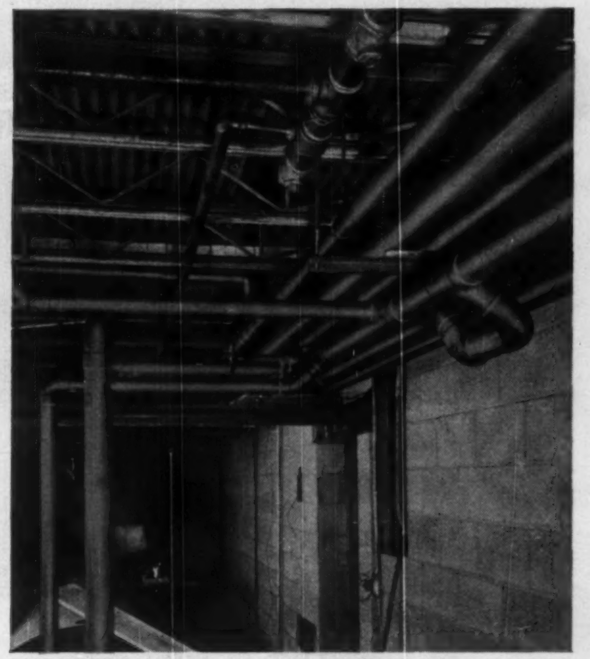


simplifies plumbing in new South Bend hospital

WATER PIPING and sanitary drainage lines of copper tube between floor and ceiling. The light weight of copper tube makes overhead work like this easier and faster. Copper tube with cast-brass solder-joint fittings was used throughout the 5-story building for the sanitary drainage system.



PARTIAL VIEW of compact copper tube installation in basement. Tight working space presents no problem with copper tube and solder-joint fittings. *Architect: John N. Marx, Chicago. General Contractor: Cornelius Pitt and Company, Chicago and South Bend. Mechanical Contractor: Allied Plumbing & Heating Co., South Bend.*

A TOTAL of 7000 feet of Anaconda Copper Drainage Tube, Type DWV, in sizes from 1¼″ to 6″, was used in the sanitary drainage system of the new South Bend, Indiana, Osteopathic Hospital. In addition, 25,000 feet of Anaconda Type L copper tube, in sizes from ½″ to 4″, was used for the hot and cold water supply lines.

In commenting on the use of copper tube for the sanitary drainage system, Mr. Cornelius Pitt, President of Cornelius Pitt and Company, general contractor, said, "It just doesn't make sense to use copper plumbing for the water supply lines and another material for the piping of the drainage system.

"The light weight and long standard lengths of copper tube, and the compact, solder-joint fittings make it much easier and faster to install. This is particularly an important economy factor in roughing-in the larger sizes required for the sanitary drainage lines of a multistory commercial or institutional building.

"Everyone concerned with the plumbing in this ultramodern hospital building—the owners, the plumbing contractor and our firm as general contractors—are satisfied that the claimed advantages of 'ALL COPPER' plumbing are, if anything, very much on the conservative side."

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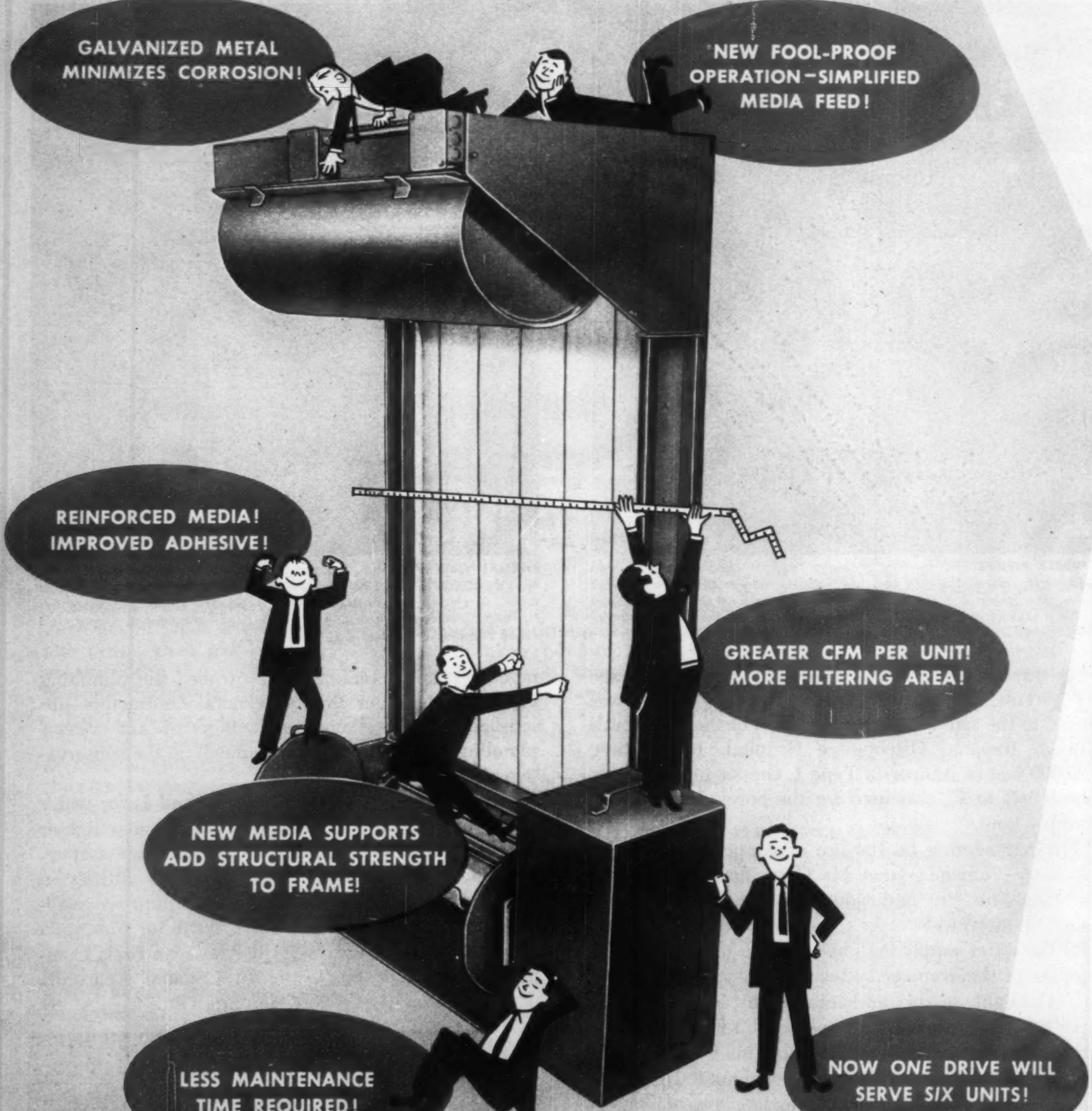
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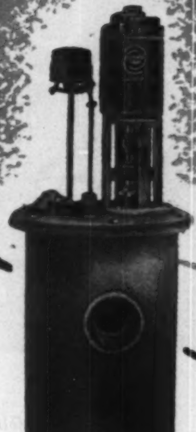
duplex unit



single unit

"UV" CONDENSATE PUMP

Compact, vertical type pump . . . consists of motor unit and float switch mechanism bolted to sump type receiver. Designed for below floor level return.

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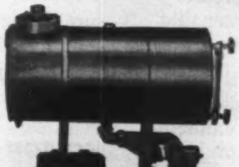

TYPE "TM" TURBINE, Capacities — boilers up to 250 H.P. Pressures up to 150 lbs.

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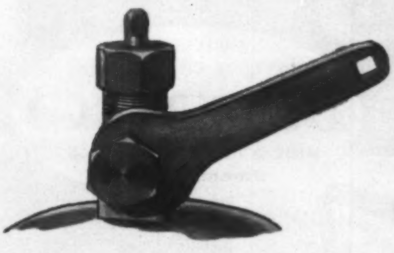
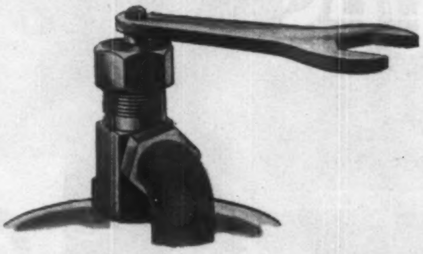


Use the Isotron Wrench As Cylinder Valve Stem Handle



You can get this useful, dual-purpose wrench FREE when you order Pennsalt Isotron from your distributor. One wrench given with *each* purchase of any size cylinder of Isotron Refrigerant 12 or Isotron Refrigerant 22. Offer—beginning April 1, 1958—good only while limited supply of wrenches lasts.

Isotron Department 579
PENNSALT CHEMICALS CORPORATION
Three Penn Center, Philadelphia 2, Pa.

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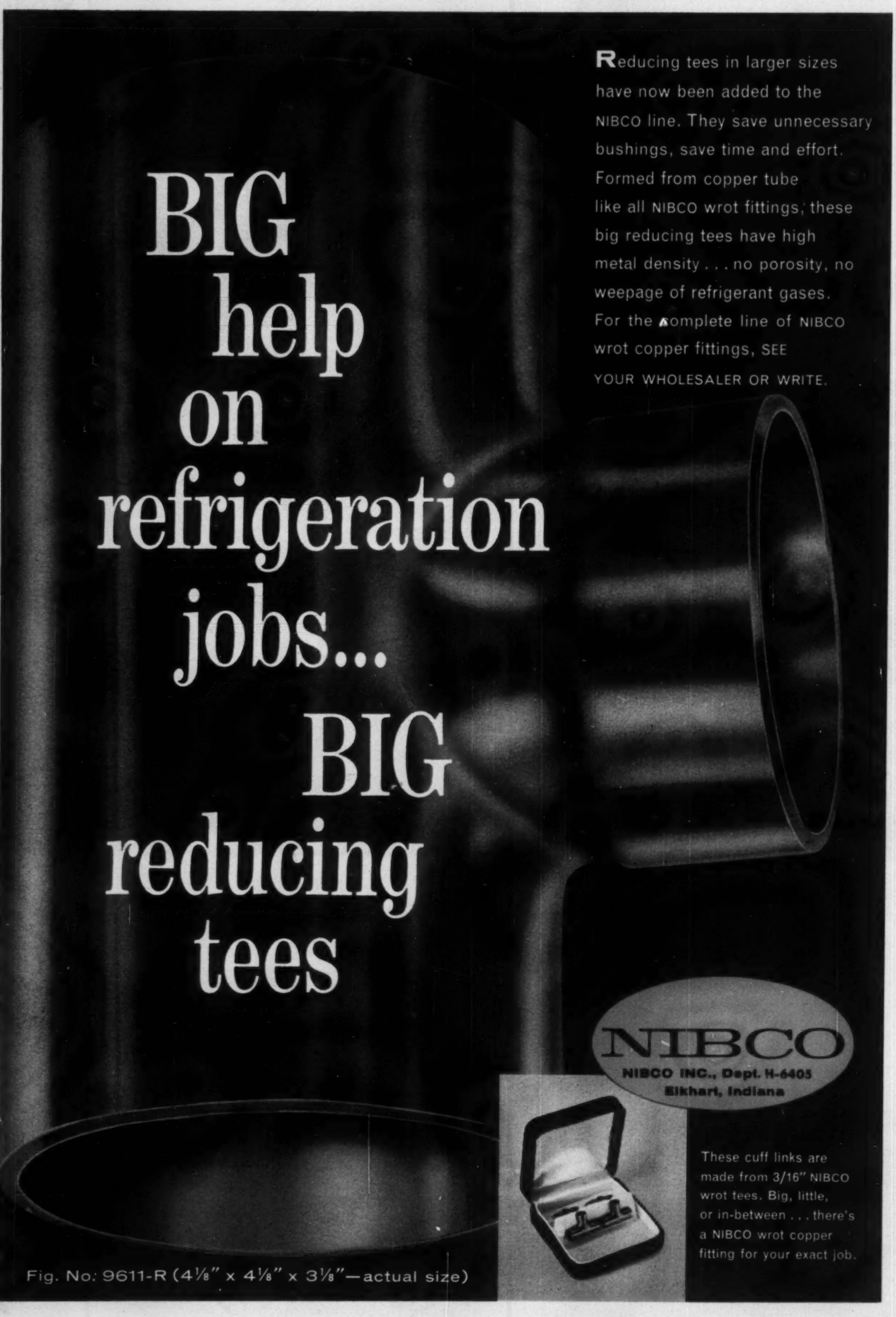
ESTABLISHED 1850



BIG help on refrigeration jobs... BIG reducing tees

Reducing tees in larger sizes have now been added to the NIBCO line. They save unnecessary bushings, save time and effort. Formed from copper tube like all NIBCO wrot fittings, these big reducing tees have high metal density . . . no porosity, no weepage of refrigerant gases. For the complete line of NIBCO wrot copper fittings, SEE YOUR WHOLESALER OR WRITE.

NIBCO

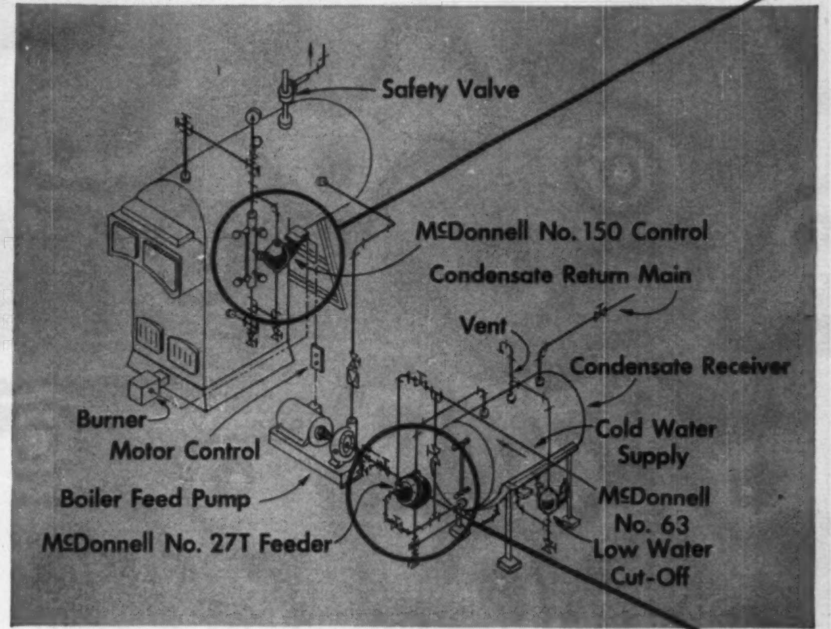
NIBCO INC., Dept. H-6405
Elkhart, Indiana

These cuff links are made from 3/16" NIBCO wrot tees. Big, little, or in-between . . . there's a NIBCO wrot copper fitting for your exact job.

Fig. No. 9611-R (4⅛" x 4⅛" x 3⅛"—actual size)

End the WATER LEVEL WORR

in those medium pressure boilers



Here's the great combination that takes all the worries and troubles out of water level and feed pump control for the many medium pressure boilers — boilers with steam pressures up to 150 psi.

The drawing above shows the simple hook-up. McDonnell No. 150 controls the boiler feed as it should be controlled — directly from the boiler water level. This holds the water level within the close limits that assure maximum steaming efficiency and fuel economy. Any deficiency in the returns is at once replaced by the McDonnell No. 27T Make-up Water Feeder installed on the receiver.

An extra switch on the No. 150 provides circuits for cutting off burner and sounding low water alarm — a final safeguard from emergency conditions such as current interruption in the pump circuit or failure of make-up supply.

Yes, this is the hook-up that gives you close control of the water level and maximum protection from low water in the broad group of medium pressure plants. Ask for simple installation and wiring diagrams covering every condition.

McDONNELL & MILLER, *Inc.*, 3500 N. Spaulding Ave., Chicago 18, Ill.

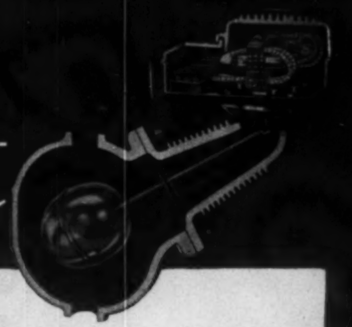
Doing One MM SAFETY CONTROLS *Thing Well*

Your Jobbe
Stocks Thi

McDONNELL

Boiler Water Level Controls

BOILER WATER FEEDERS • LOW WATER FUEL CUT-OFFS • PUMP CONTROLLERS • RELIEF VALVES • FLOW SWITCHES • RELATED LIQUID LEVEL CONTROLS FOR TANKS, STILLS, AIR CONDITIONING SYSTEMS

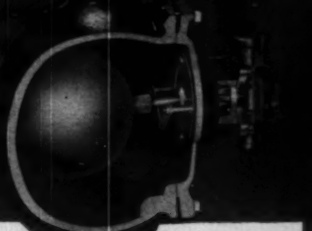


McDONNELL No. 150

PUMP CONTROL

No. 150 can be used as a pump control, low water fuel cut-off and low water alarm. It has two mercury switches (Underwriters' listed); one for starting and stopping feed pump; the other for low water cut-off of burner and sounding low-water alarm bell if desired.

It has proved its ability in thousands of plants to stand up under the pressures and temperatures encountered in boilers of any size or type with maximum steam pressure, 150 psi. Packless construction is provided by extra heavy monel sylphon — no stuffing boxes to cause trouble. Switch leads have heat-impervious porcelain-bead insulation. Mechanism is sealed from tampering. Other types for higher pressure boilers.



McDONNELL No. 27T

MAKE-UP FEEDER

No. 27T is a float-operated make-up water feeder particularly well qualified for the tough job of maintaining the required water level in receiving tanks.

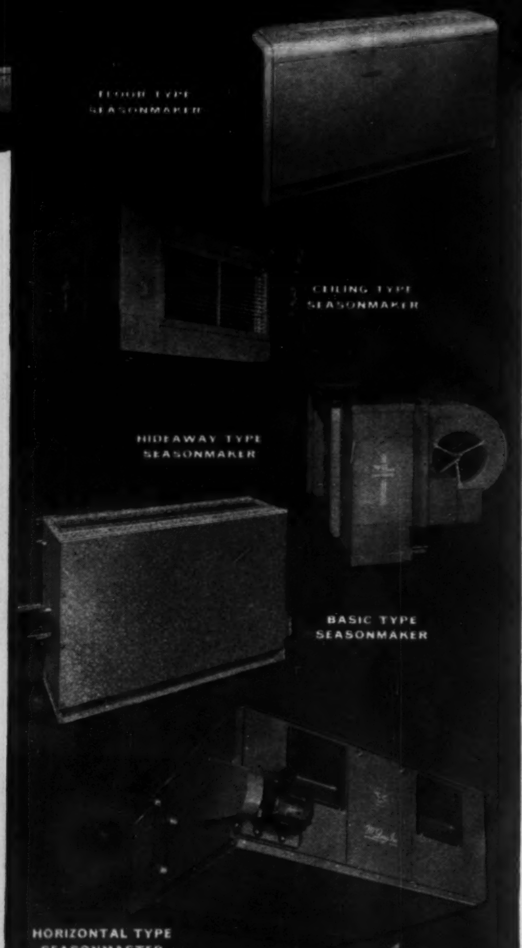
Large water feeding capacity when water is required, permits the location of the No. 27T at a relatively low point on the receiving tank. This provides adequate space for return condensate, preventing wasteful overflow. Sturdy construction enables it to withstand turbulent conditions so often present in receivers. It is built for tank pressures up to 35 lbs.; water supply pressures to 100 lbs.* Other McDonnell Make-up Feeders, including flange-mounted types are available for practically all needs.

*A further precaution is the McDonnell No. 63 Low Water Cut-off which prevents pump operation in case water supply is interrupted.

HERE ARE 131 MORE REASONS WHY "the Sands" IS FAMOUS

SANDS SHOP
Sands

The Sands Hotel, Tucson, Arizona
Architects: Hausner & Macsai, Chicago, Ill.
General Contractor: Murray J. Shift Construction Co., Tucson, Arizona
Mechanical Contractor: Aire Engineering Co., Tucson, Arizona.



McQuay

SEASONMAKER • SEASONMASTER

Air Conditioning Units

To those who winter in Arizona as well as those who spend all of their time in this picturesque vacationland, the Sands Hotel is famous. And here are 131 more reasons why. The Sands is completely air conditioned by 129 McQuay Seasonmaker individual room units and two McQuay Seasonmaster Central Type units for the larger areas, which provide both heating or cooling as the weather demands. For the greatest flexibility, for the greatest possible efficiency and economy, investigate McQuay. Call in your McQuay representative and have him show you why you can always depend upon McQuay proven products. McQuay, Inc., 1601 Broadway St. N. E., Minneapolis 13, Minnesota.

McQuay Means Quality

FLOOR TYPE SEASONMAKER—for free standing floor mounting. Four sizes, 200 cfm to 600 cfm, ½ to 2 ton nominal cooling capacity. Both thermally and acoustically insulated. Choice of three air discharge grilles.

CEILING TYPE SEASONMAKER—for suspended mounting. Seven sizes, 200 cfm to 2000 cfm, ½ to 5 ton nominal cooling capacity. Both thermally and acoustically insulated.

HIDEAWAY TYPE SEASONMAKER—for concealed, suspended mounting in closets, attics or furred spaces. 7 sizes, 200 cfm to 2000 cfm, ½ to 5 ton nominal cooling capacity. Insulated drain pan.

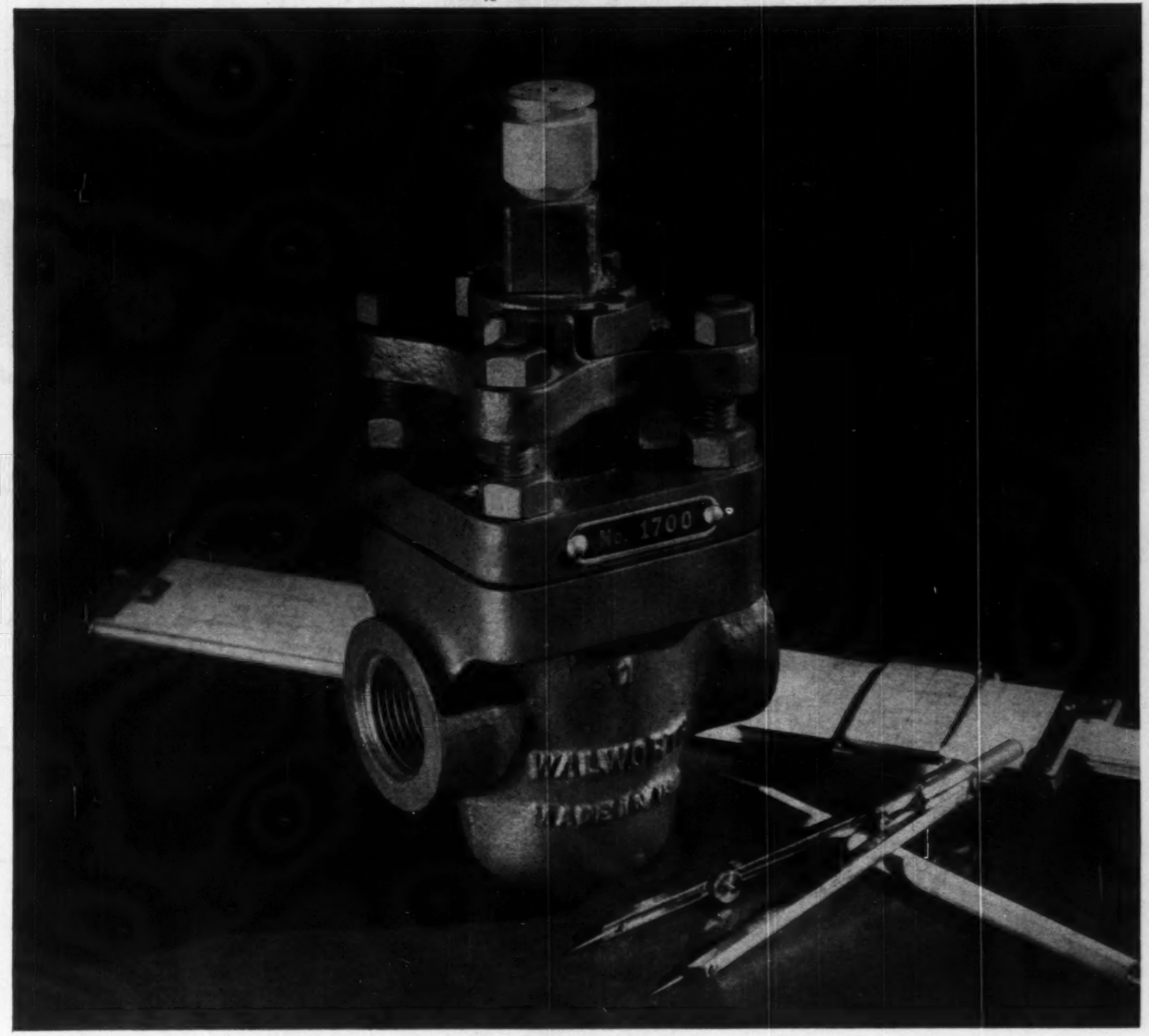
BASIC TYPE SEASONMAKER—for fully recessed built-in wall installations. Four sizes, 200 cfm to 600 cfm, ½ to 2 ton nominal cooling capacity. Thermally and acoustically insulated.

HORIZONTAL SEASONMASTER—for central station air conditioning, available with cooling coil, heating coil, bypass, mixing box and filter section. Removable panels permit inspection or service. Seasonmaster coils are made with exclusive McQuay Ripple-Fin construction.

McQuay INC.

AIR CONDITIONING
HEATING
REFRIGERATION

Illustrated here is the Walworth Lubricated Plug Valve No. 1700, available in sizes from ½" to 5" inclusive, suitable for 200 pounds water, oil, or gas working pressure.



problem-solvers for tough jobs

*LPV's by WALWORTH

If you're familiar with the basic advantages of Plug Valves, you know why Walworth Lubricated Plug Valves work so well in really tough spots. You know about their direct port opening . . . their dead tight shut off. Seating and sealing surfaces are fully protected from attack by fluids being handled by insoluble lubricants.

**Lubricated Plug Valves*

Remember, you can get Walworth LPV's in all sizes . . . from ½ to 30 inches . . . for pressures up to 5000 psi and for vacuum service . . . in a number of different styles and patterns. For more information about LPV's and for your copy of the new Walworth LPV Circular, see your local Walworth Distributor.

WALWORTH
750 THIRD AVENUE, NEW YORK 17, N. Y.
DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

WALWORTH SUBSIDIARIES: ALLOY STEEL PRODUCTS CO. • CONOFLOW CORPORATION • GROVE VALVE AND REGULATOR CO. SOUTHWEST FABRICATING & WELDING CO., INC. • M&H VALVE & FITTINGS CO. • WALWORTH COMPANY OF CANADA, LTD.

Know-how makes the

IN INSTALLATION AND SERVICE ENGINEERING

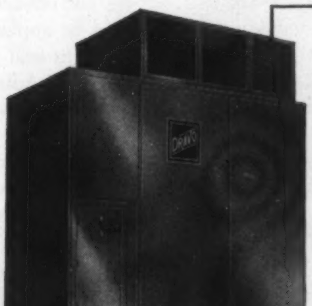
Dravo's new *Counterflo* is the only industrial space heater backed by a world-wide organization. The map gives you an idea of the number and location of the qualified heating engineers, sales and service offices, representatives and foreign licensees who form this global network.

This means that a *Counterflo* owner not only has outstanding heater performance, but also a highly trained, factory-schooled service organization on 24-hour call. Should the need arise, service, for both installation and maintenance, is as close as your telephone. Dravo's wide-spread field activity is supplemented by the Pittsburgh staff, who stand ready to fly to any part of the country immediately.

This is just one of the many outstanding benefits available with your new *Counterflo*. For more information, write for Bulletin 564. Address DRAVO CORPORATION, DRAVO BUILDING, PITTSBURGH 22, PA.

DRAVO
CORPORATION

difference



5 REASONS WHY THE DRAVO COUNTERFLO IS YOUR BEST SPACE HEATER BUY

NEW PYROJET BURNER—exclusively Dravo—first burner developed specifically for direct-fired space heaters. Burns low cost oils efficiently. Switches from gas to light oil automatically.

NEW INDUCED DRAFT FIRING—automatically controls fuel/combustion air ratio, high negative pressure in combustion chamber adds extra safety; extra efficiency because of complete control of combustion air.

NEW AIRFOIL COMBUSTION CHAMBER—stainless steel, ribbed for extra strength and channeling of airflow—guaranteed for 10 years. Longest possible flame travel for complete combustion within primary heat transfer area.

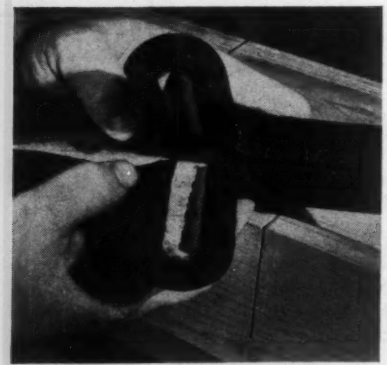
NEW LOW-SPEED FANS—forwardly curved, low-speed, double inlet fans with high efficiency reduce horsepower requirements in the new Counterflo drastically, operating costs are lower.

NEW DISCHARGE PLENUM—distributes heated air at high velocity without annoying drafts. Adds new flexibility to warm air distribution patterns.

Armstro
Armstrong
ADHESIVE
520

Waterproof joints are assured when you use Armstrong 520 Adhesive. The cement forms a strong bond that resists deterioration with age.

520 Adhesive assures vapor-tight joints on Armaflex insulated lines



Fitting covers are no problem with Armaflex. They're quickly assembled from miter-cut segments, joined with 520 Adhesive.

Cold line insulation must be sealed tight against vapor if it is to stay dry and efficient in service. For a tight job, vaporproof Armaflex pipe covering should be applied with vaporproof 520 Adhesive. Its waterproof bond provides an excellent seal at all joints, grows stronger with time, and resists deterioration as it ages. 520 Adhesive is easy to use. A thin brush coat is applied to both surfaces to be joined, allowed to dry, and the surfaces are pressed together.

This adhesive is the only sundry material required for the installation of Armstrong Armaflex. No bands, twine, protective coatings, canvas, or cements are necessary. Fitting covers are made up from miter-cut Armaflex pieces, assembled with 520 Adhesive.

Full details on Armstrong 520 Adhesive, as well as Armaflex Pipe Covering, are contained in free descriptive folder. For your copy, write today to Armstrong Cork Company, 2205 Sherman Street, Lancaster, Pennsylvania.

Armstrong INSULATIONS

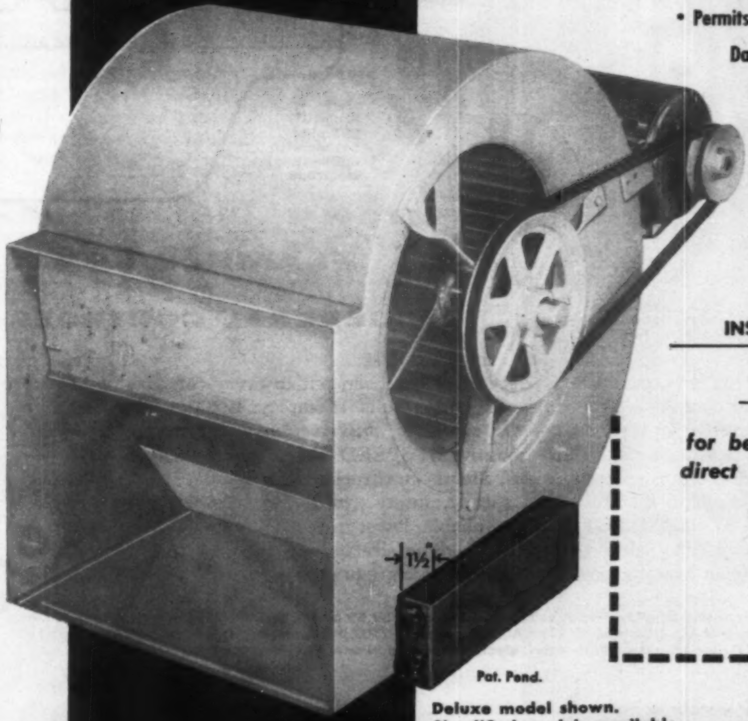
upgrade your unit now with . . .

Send for FREE data *

Du-Air 2-VOLUME AIR DELIVERY

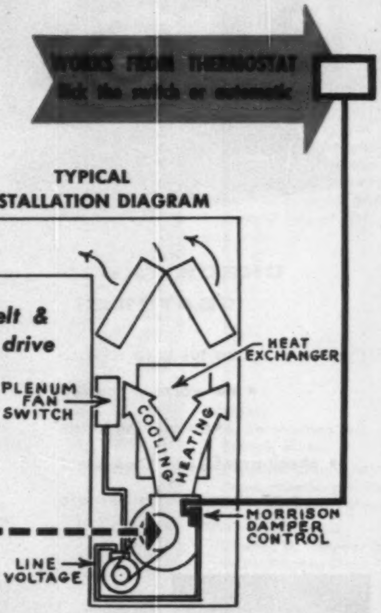
you can design for Ideal Heating and Cooling with a MORRISON Damper Control Blower

- Permits Ideal Heating
- Eliminates Pulley Change
- Permits Ideal Cooling
- Eliminates Motor Operated Dampers
- Eliminates two speed fans, fans in series and fans operating individually



Pat. Pend.

Deluxe model shown.
Simplified models available.


WORKS FROM THERMOSTAT
flick the switch or automatic
for belt & direct drive
HEAT EXCHANGER
PLENUM FAN SWITCH
COOLING
HEATING
MORRISON DAMPER CONTROL
LINE VOLTAGE

TYPICAL INSTALLATION DIAGRAM

ADAPTABLE TO PRESENT SYSTEMS!

- No Added Space Required
- Reduces Installation Costs
- One Control for all Installations

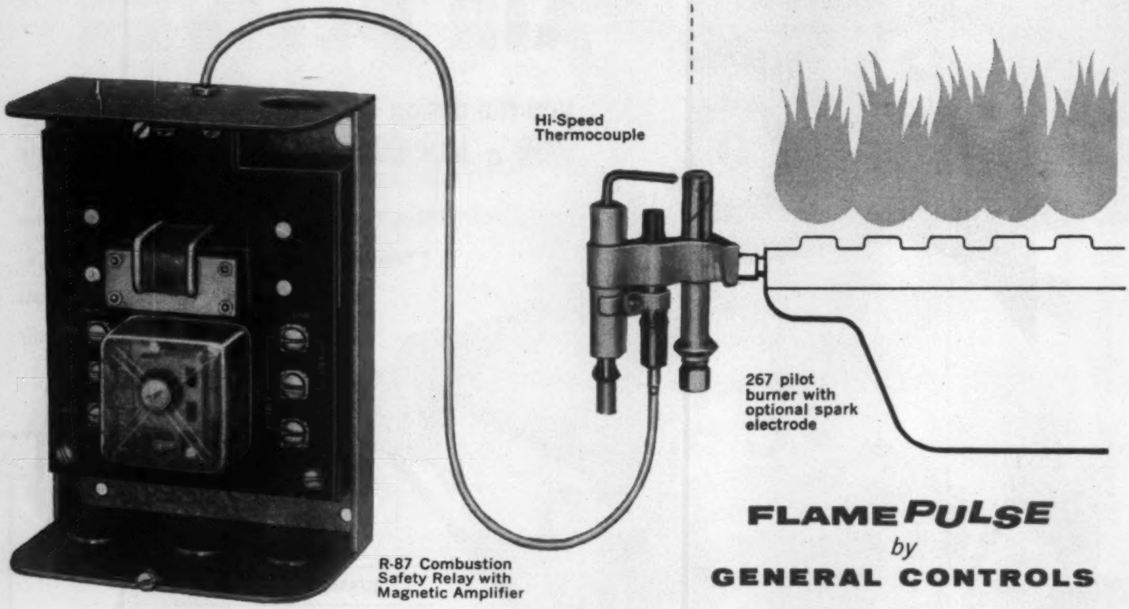
MORRISON PRODUCTS, INC.
16816 Waterloo Road • Cleveland 10, Ohio

***YES . . . please send me typical installation diagrams of the MORRISON DAMPER CONTROL BLOWER**

NAME ____________________
TITLE ____________________
COMPANY ____________________
ADDRESS ____________________
CITY ____________________ ZONE ________
STATE ____________________

NEW HIGH SPEED THERMOCOUPLE GIVES 5-SECOND SHUTDOWN!

a whole new concept in FLAME SAFETY for medium-size gas burners


Hi-Speed Thermocouple
267 pilot burner with optional spark electrode
R-87 Combustion Safety Relay with Magnetic Amplifier

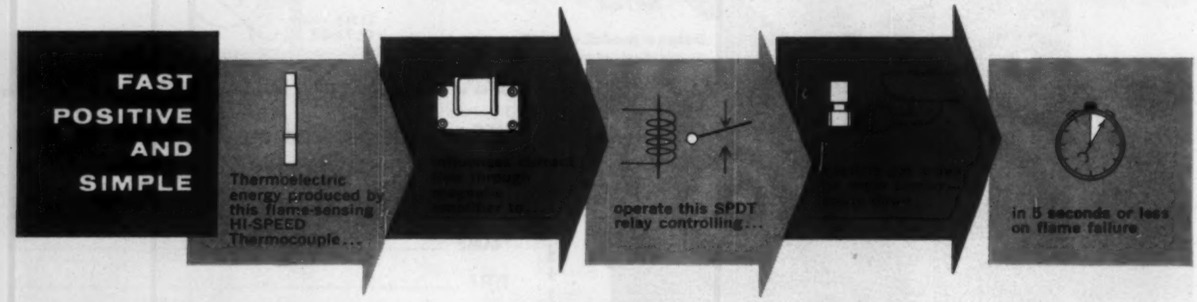
FLAME*PULSE*
by
GENERAL CONTROLS

CHECK THESE FEATURES:

- no tubes to replace
- no warm-up period
- no moving parts
- shock-proof...damage-proof
- no chance to fail unsafe

This new combustion safety relay has been put to every conceivable field test for over 3 years... with remarkable results. It employs two proved principles for positive operation: *reliable magnetic amplification* and *time-proved thermo-electric energy*. Flame-sensing HI-SPEED thermocouple responds to flame failure in 5 seconds or less. Simple construction...uncomplicated installation... simplified maintenance...speed...surety...*all* make the new General Controls R-87 FLAMEPULSE more reliable, lower in cost and upkeep. It's the *low-cost* answer to safety control for medium size burners in warm air, hot water and steam-heating, cooking and processing equipment in sizes to 2-million BTUs.

Magnetic amplifier input voltage: 24,115 or 230V 60 cy AC; SPDT Relay Switch Rating: 3 amps @ 24V AC; 1.5 amps @ 115V AC; .75 amps @ 230V AC. Companion Pilot Burner: No. 267: 1800 BTU for all gases. With spark electrode and additional generator cartridge.


FAST
POSITIVE
AND
SIMPLE
Thermoelectric energy produced by this flame-sensing HI-SPEED Thermocouple...
influences current flow through magnetic amplifier to...
operate this SPDT relay controlling...
in 5 seconds or less on flame failure

another advance from...

TEST SAMPLE—Commercial burner and boiler manufacturers: Ask your nearby General Controls office for sample to test with your own equipment.

GENERAL CONTROLS

Manufacturers of America's Finest Automatic Controls for Home, Industry and the Military
Glendale, Calif. • Skokie, Ill. • Guelph, Ontario, Canada
Six Plants—42 factory branch offices serving the United States and Canada

"SPANG Steel Pipe gave us clean, tight welds...

assuring long, efficient service"

says Mr. Lawrence F. Carella, Superintendent, Crane Plumbing & Heating Company, Cambridge, Mass.

"The air conditioning system for the United Shoe Corporation Building, Boston, required 2,000 weldments, accounting for 50% of our working time," reports Mr. Carella. "Thanks to SPANG Steel Pipe, many installation difficulties were eliminated."

SPANG PIPE REDUCES EXTRA WORK

"SPANG Steel Pipe always gave us a true end cut, and the inner walls contained no dirt or scale. Also important, to make this air conditioning work at peak efficiency, the welded joints must be absolutely tight—without the use of caulking. The clean, tight welds we got with SPANG Pipe mean long, efficient service on this job."

SPECIFY SPANG FOR YOUR NEXT JOB

You, too, can get the same top-quality performance with SPANG. And your local SPANG Distributor will give you top-quality service on your order. You'll get a superior-grade pipe manufactured under strict *quality-controlled* methods.

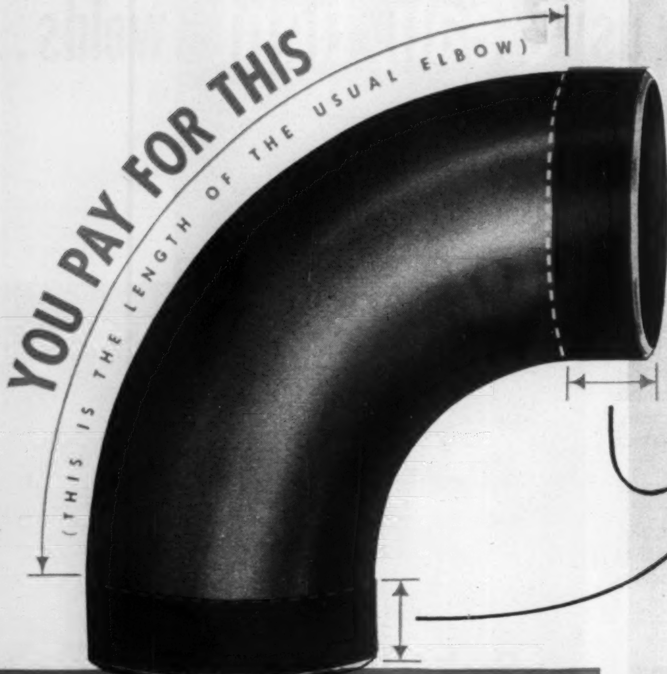
Next job—make it steel pipe . . . make it SPANG!

SPANG-CHALFANT
DIVISION OF THE NATIONAL SUPPLY COMPANY
General Sales Offices:
Two Gateway Center, Pittsburgh, Pa.

SPANG®
CW STEEL PIPE

Mr. Carella states that SPANG Steel Pipe made this installation "quicker and easier," and that the interior walls of the SPANG Pipe were free of dirt and scale.

Engineer:
A. Ehrenzeller, Inc.
Boston, Mass.
Mechanical Contractor:
Crane Plumbing & Heating Co., Cambridge, Mass.
SPANG Distributor:
Charles D. Sheehy, Inc.
South Boston, Mass.



YOU GET A

BONUS

WITH EVERY

MIDWEST

"LONG TANGENT" ELBOW

21% to 42% MORE ELBOW AT NO EXTRA COST

It's a built-in bonus that comes right with the elbow . . . a tangent or straight section at each end of the fitting.* Benefits of this bonus . . . this extra value . . . are yours AT NO EXTRA COST because Midwest "Long Tangent" Elbows are PRICED THE SAME AS OTHER ELBOWS. It's a value you can't afford to miss.

For additional information, ask your Midwest distributor or write us for Catalog 54.

*Size 24" and smaller have tangents equal to ¼ nominal pipe size; for example, 12" ell has 3" straight ends. Above 24" pipe size, all tangents are 6" long.

ADVANTAGES OF MIDWEST "LONG TANGENT" ELBOWS

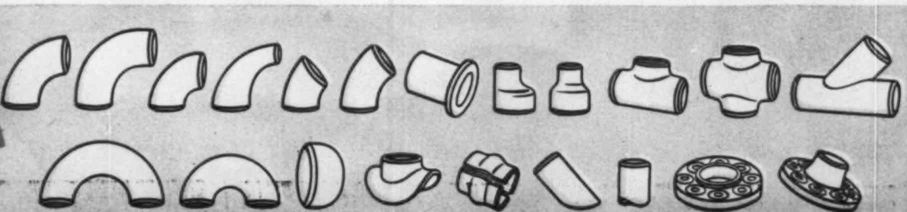
- **They save pipe.**
- **They often eliminate short nipples and their extra welds.**
- **They save time and money in lining up and clamping pipe and fitting.**
- **They make it easier to apply slip-on flanges.**
- **They remove the circumferential weld from point of maximum stress and can be sleeved.**

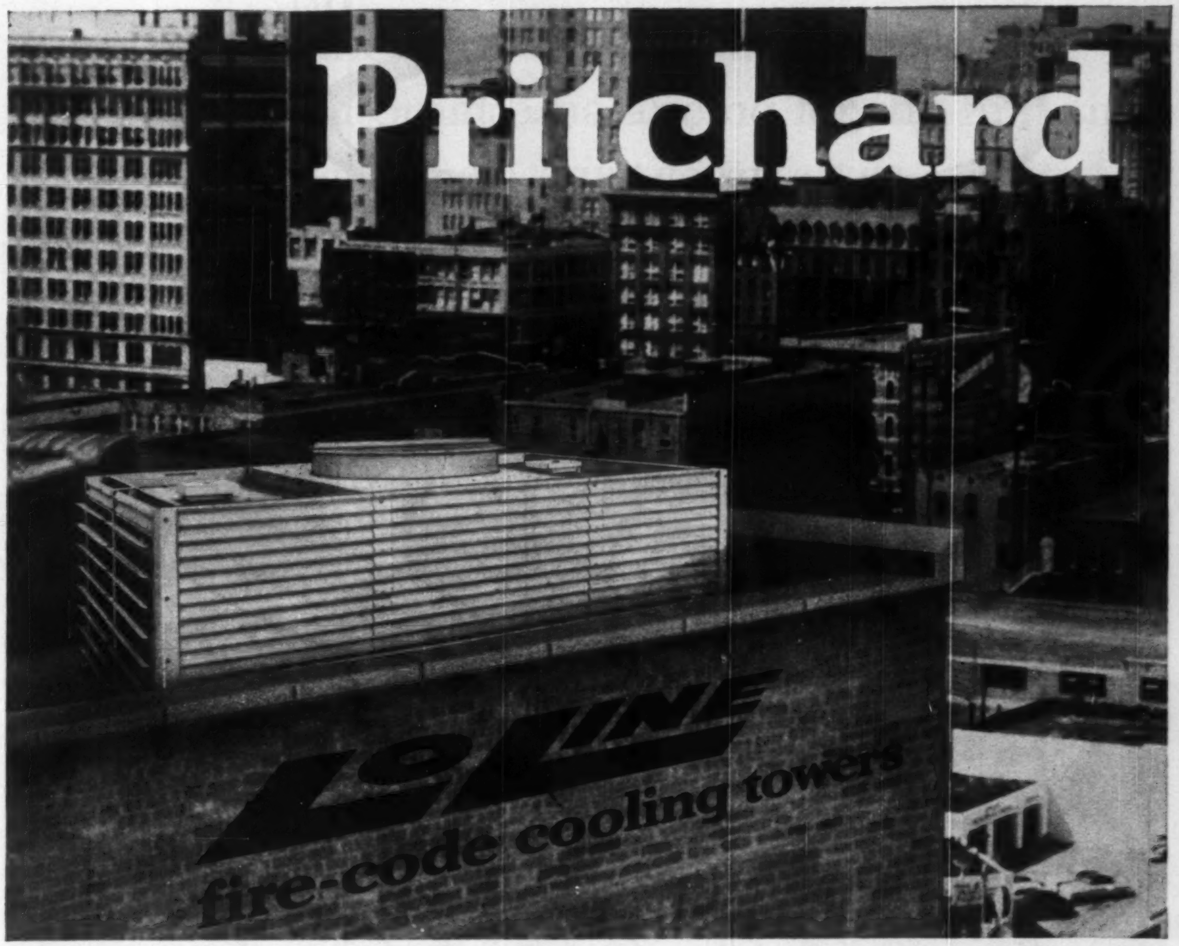
THEY COST NO MORE THAN OTHER ELBOWS

MIDWEST PIPING COMPANY, INC.
Main Office: St. Louis 3, Missouri (P.O. Box 433)
Plants: St. Louis, Clifton, N.J. and Los Angeles
SALES OFFICES: ASHEVILLE (Box 446, SKYLAND, N.C.) • ATLANTA 9—72 ELEVENTH ST. N.E.
BOSTON 27—426 FIRST ST. • CHICAGO 3—79 WEST MONROE ST.
CLEVELAND 14—616 ST. CLAIR AVE. • HOUSTON 2—1213 CAPITOL AVE.
LOS ANGELES 33—520 ANDERSON ST. • MIAMI 34—2103 LE JEUNE RD.
NEW YORK 7—50 CHURCH ST. • PITTSBURGH 19, PA.—437 GRANT ST.
ST. LOUIS 4—1450 S. SECOND ST. • SAN FRANCISCO 11—420 MARKET ST.
STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

7681

MIDWEST
WELDING FITTINGS
IMPROVE
PIPING DESIGN
AND
REDUCE COSTS





For metropolitan areas where attractiveness is desirable—and fire safety is essential

The new Pritchard LoLine cooling tower, companion to the Pritchard LoLine wood-framed tower, is specifically designed to conform to standard metropolitan fire codes. All structural members are steel. Louvers, casing, water distribution system and fan deck are asbestos cement. There simply is no combustible material exposed to the risk of fire.

But more than a fire-safe tower, this is a handsome cooling tower. Its low, sleek profile and uniform exterior treatment lift it out of the "necessary evil" class. It is well suited to installation where architectural considerations are important to the purchaser.

And it's a rugged tower. All steel parts are hot-dipped galvanized *after* fabrication for extra corrosion resistance. Heart quality California Redwood *only* is used for fill and drift eliminators to insure long, trouble-free life. Tough asbestos cement board exterior never needs painting. Tower maintenance is practically nil.

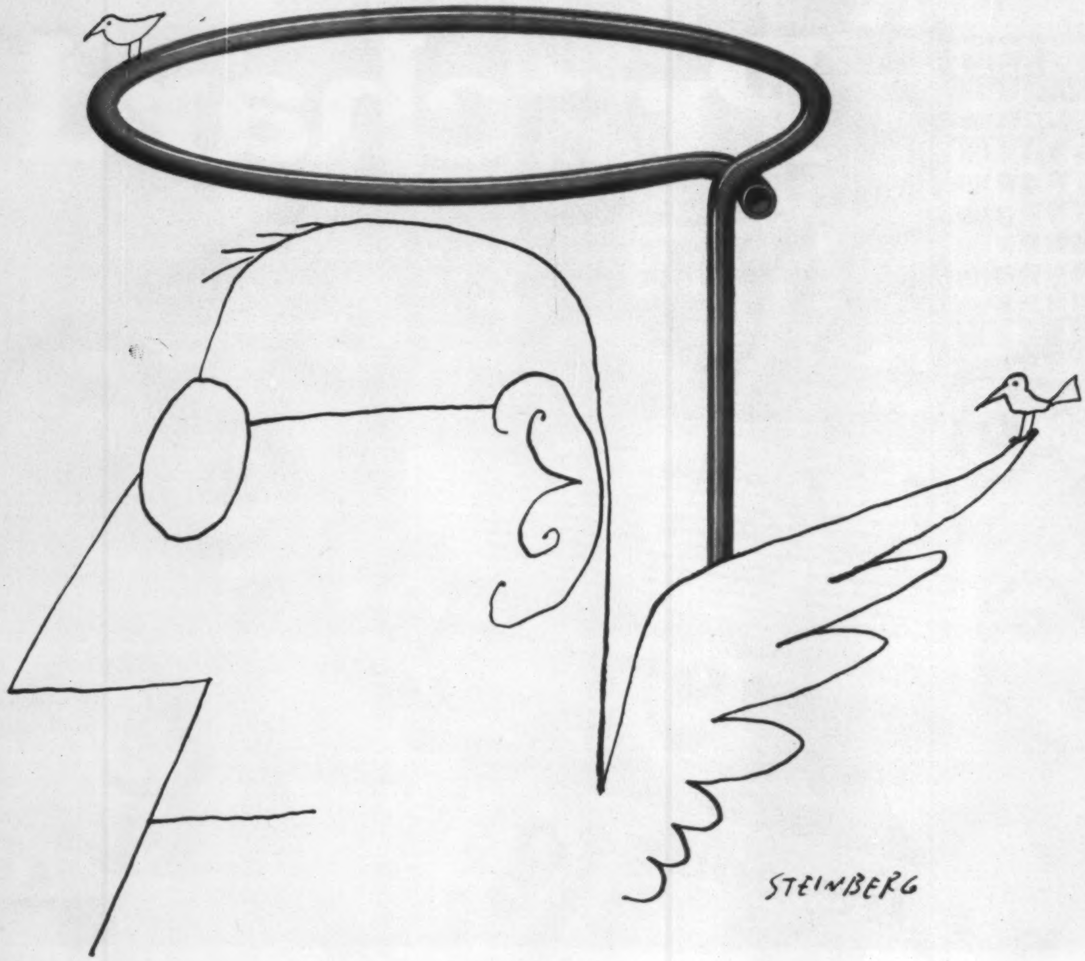
For full information on Pritchard LoLine Fire-Code Cooling Towers, mail coupon for Bulletin 5.2.902, which gives dimensions, mechanical details, specifications—the whole story. Or consult your nearby representative, whose name is listed in the Yellow Pages under "Towers."

Pritchard
LoLine
Fire Code
Cooling
Towers

J. F. PRITCHARD & CO. OF CALIFORNIA
Dept. 100, 4625 Roanoke Parkway, Kansas City 12, Mo.

☐ Send bulletin 5.2.902 on LoLine Fire-Code Towers
☐ Send bulletin 5.1.902 on Lo-Line Wood-Framed Towers
☐ Have your representative contact me

Name.......................................Title..................
Firm..
Address...
City..............................Zone......State..................



How to beat Old Debbil Time . . .

everlasting

We frustrate Time . . . by forming Lewin-Mathes Seamless Tube and Pipe out of *ageless Copper* . . . heavy-walled and durable . . . smelted to meticulous purity in our own refinery.

We take Time . . . as *integrated specialists*, to test and check and analyze each step in production—from raw material to finished product—to guarantee perfect, *enduring* quality.

We save you Time . . . through a nation-wide network of Service Offices and Mill Depots, linked by Teletype, to assure *on-schedule* deliveries.

The Time *you* take to specify Lewin-Mathes for your Copper Tube and Pipe applications will be to your *everlasting* credit—and satisfaction!

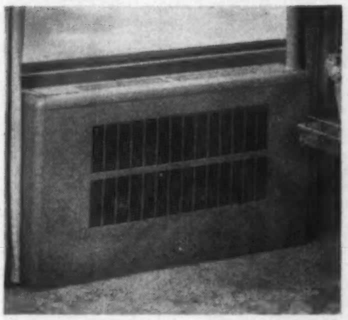
LEWIN MATHES

SAINT LOUIS, MISSOURI

COPPER AND BRASS TUBE PIPE AND ROD
DIVISION OF CERRO DE PASCO CORP.

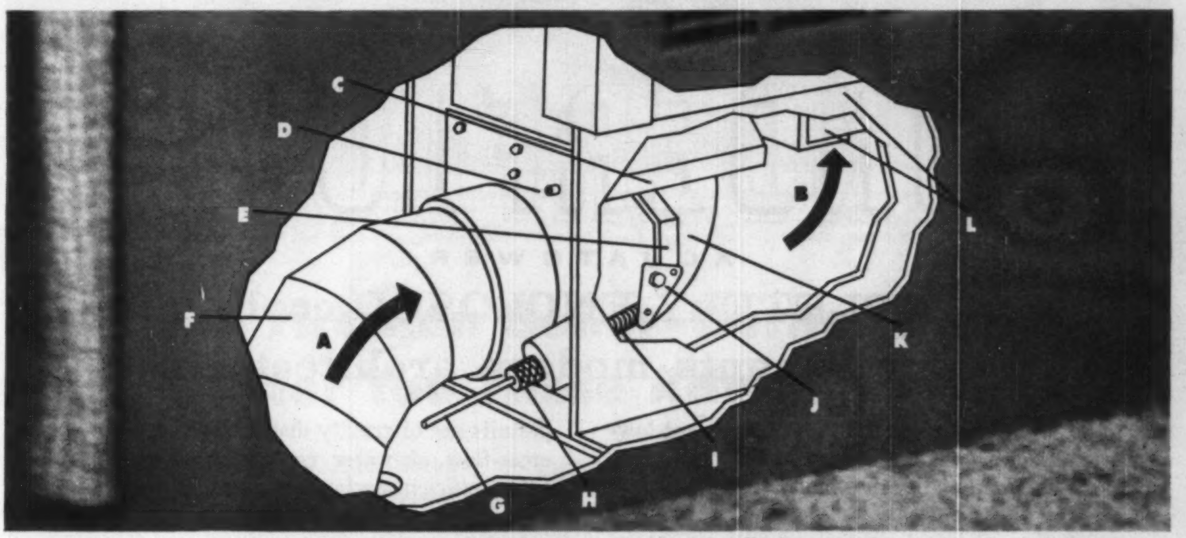
New Trane Air Flow Regulator provides permanent, automatic balancing for the first time

Major engineering advance cuts induction system balancing costs



Now, use a high pressure induction system for perimeter air conditioning of big buildings that will be balanced correctly from the start and will stay in balance automatically. TRANE engineering now brings you induction UniTrane units with the new Air Flow Regulator that acts automatically to assure proper air delivery and performance. Factory installed for either left hand or right hand air supply, the Air Flow Regulator obtains and maintains uniform air delivery. And when cooling requirements change due to tenant changes, one simple manual operation adjusts the unit—without affecting any other units in the system.

Talk to your nearby TRANE Sales Office about the advantages of the induction UniTrane system with the new Air Flow Regulator. Or write TRANE, La Crosse, Wisconsin.



(A) duct pressure **(B)** plenum pressure **(C)** diaphragm **(D)** vent **(E)** diaphragm linkage **(F)** air supply duct
(G) adjusting rod **(H)** locking knob **(I)** spring **(J)** lever **(K)** damper **(L)** baffles

HOW THE NEW TRANE AIR FLOW REGULATOR WORKS: Operating on the principle of opposed pressures, the new TRANE Air Flow Regulator is easy to balance, stays in balance automatically.

Any change in pressure in the supply duct—whether a temporary fluctuation or a change caused by alterations elsewhere in the system—is offset automatically. Plenum pressure is kept constant at all times. Since the plenum pressure controls the air flow through the nozzles, the output of the unit remains constant—even though the pressure of the primary air in the supply duct may vary widely. A diaphragm, installed within the plenum, is linked to an aerodynamically balanced butterfly damper in the supply duct. Movement of this butterfly damper adjusts the plenum pressure.

The diaphragm is influenced by the plenum pressure on one side, opposed by an adjustable spring on the other side. The plenum pressure against the diaphragm, in opposition to the force of the spring, determines the damper position.

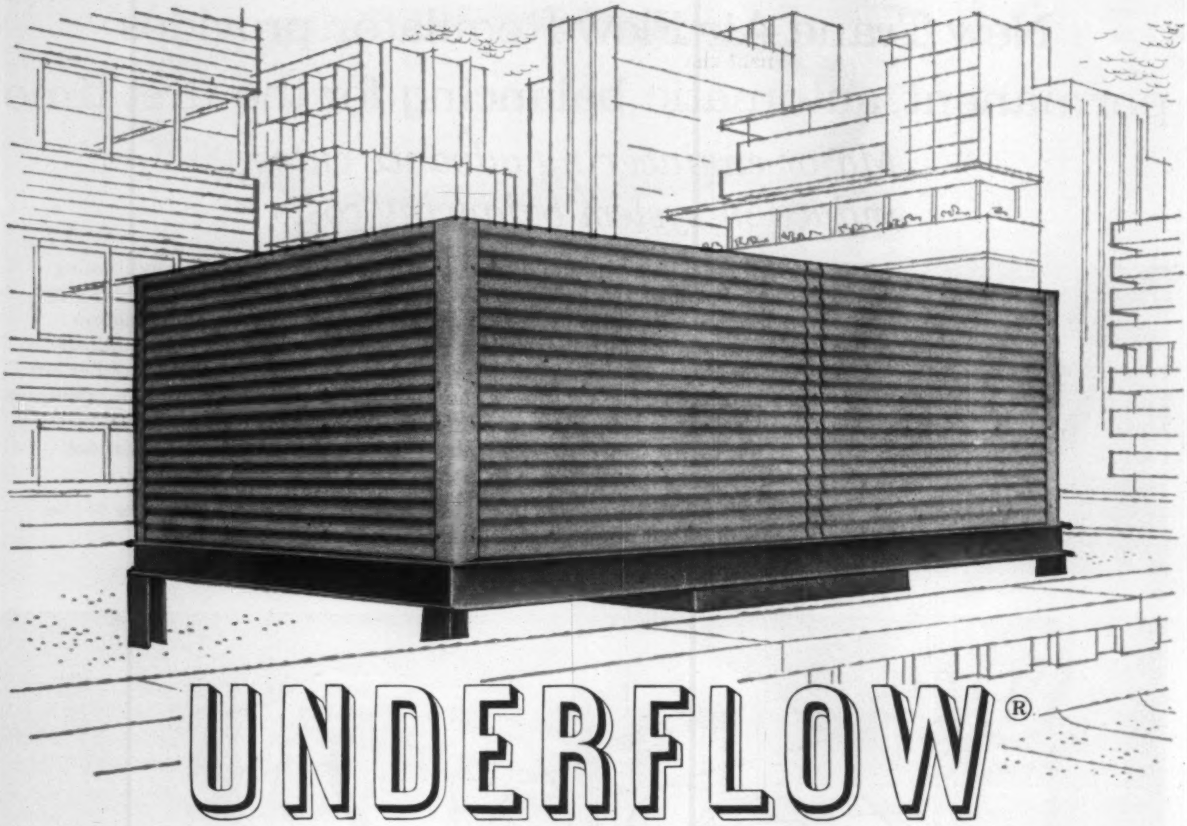
A rugged, precision device, the regulator assures a degree of system balance unattainable with the "trial and error" method of manual balancing. Only in a well-balanced system is the full measure of air conditioned comfort—the true value of the investment—obtainable.

For any air condition, turn to

TRANE

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

THE TRANE COMPANY, LA CROSSE, WIS • SCRANTON MFG. DIV., SCRANTON, PA. • CLARKSVILLE MFG. DIV., CLARKSVILLE, TENN. • TRANE COMPANY OF CANADA LTD., TORONTO • 87 U. S. AND 19 CANADIAN OFFICES



UNDERFLOW®

AQUATOWER

New COMPLETELY ENCLOSED cooling tower complements modern architecture

"I've got a secret," says this newest low-silhouette cooling tower. The UNDERFLOW, in reality, has many secrets, for it is the only tower that is designed to conceal fan, mechanical equipment and air intake area. Even the piping is out of view. The UNDERFLOW is completely encased with asbestos cement board on all sides and most of the top; in appearance it is an integral part of the structure it serves—no need for expensive masonry enclosure.

Its very principle of operation is an innovation in cooling towers. The fan is located beneath the tower and forces air upward into a plenum chamber from which it is diverted horizontally into dual cooling chambers, then discharged vertically at two sides of the tower. This method of cooling permits use of gravity distribution of water, cross-flow air-water contact, close-packed fill for efficient performance, and it produces an inherent sound baffling effect.

This newest intermediate capacity tower offers several important economies. Its steel basin incorporates the primary tower grillage members. Piping and wiring requirements are minimized and simplified since the tower has its own internal distribution system and because the fan, gear drive and motor are mounted below the tower. All connections are made beneath the tower. This location of mechanical equipment eliminates much of the time required for normal inspection and maintenance—the ladder is no longer a standard service accessory.

TO GET THE INFORMATION THE TOWER ITSELF CONCEALS, CONTACT THE MARLEY SALES ENGINEER IN YOUR CITY, OR WRITE FOR BULLETIN UA-58.

MARLEY® **The Marley Company** Kansas City, Missouri

IRON FIREMAN
FORCED DRAFT BOILER-BURNER UNITS
FOR GAS, OIL, OR GAS-OIL COMBINATION
TITUSVILLE

Shown above are two Iron Fireman RFA-60 burners and Titusville boilers in operation at the New York Telephone Company, New York, N. Y. Burners are forced draft for firing oil. Mr. Edward L. McHugh, Building Maintenance Supervisor of the New York Telephone Company states, "Dependable, uninterrupted service and minimum maintenance has characterized the operation of these burners." Architect: Vorhees, Walker, Smith and Smith, New York; Consulting Engineer: Syska & Hennessey, New York; Heating Contractor: Jarcho Bros., Long Island, N. Y.

Iron Fireman Boiler-Burner Units Offer You These Advantages

Easy to size and specify. After deciding on the fuel (gas, oil or gas-oil dual fuel) and determining the required load, it is only necessary to refer to a simple chart to find the correct size of boiler-burner unit for your job.

No high stacks — no high ceilings. Forced draft eliminates costly and unsightly stacks. Compact boiler requires little headroom.

Low installation cost. Installation costs are low. No special boiler setting; no intricate wiring (factory wired and tested control panel is part of the unit); no complicated piping; no on-the-job refractory work. Factory engineering throughout assures exceptional fuel economy. Models for any type of high or low pressure gas, or any grade of oil from No. 2 to low cost No. 6.

Separate firing units available for all types of boilers. The Iron Fireman forced draft burner is a complete firing system which requires little, if any, firebox alteration, no pit for underfloor air, no ignition arch. Easily applied to new or existing boiler settings.

Send for catalog with complete specifications

IRON FIREMAN.

AUTOMATIC FIRING EQUIPMENT
FOR OIL, GAS, COAL

IRON FIREMAN MANUFACTURING COMPANY
3082 West 106th Street, Cleveland 11, Ohio.
(In Canada, 80 Ward Street, Toronto, Ontario.)

Please send information on following equipment:

☐ Complete boiler-burner units.
☐ Forced draft firing units.

Name____________________

Firm____________________

Address____________________

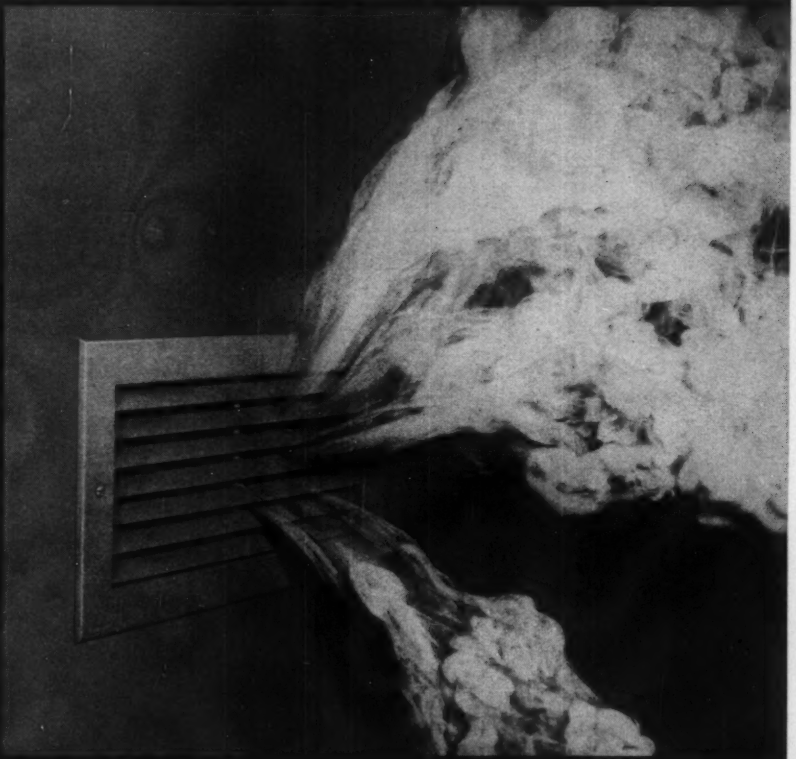
City__________Zone____State______

All WATERLOO Registers and Grilles are tested and approved by ANEMOSTAT® Laboratories

TESTED · APPROVED · ANEMOSTAT CORPORATION OF AMERICA

A

This smoke test picture, illustrating the exhausting of room air through Waterloo style 3H Return Air Grille, was taken in the Anemostat Laboratories in Hartford, Connecticut. It is one of a series of tests conducted by Anemostat research engineers to insure maximum efficiency of Waterloo equipment. In installations throughout the country, Waterloo registers and grilles are used with Anemostat air diffusers — a combination that results in top-quality performance.



Waterloo supply registers and grilles feature the exclusive silent flow "tear drop" louvre design. They are manufactured in a modern plant using the most efficient techniques, and every Waterloo unit is backed by 56 years of experience in air conditioning, heating and ventilating applications. ● These, plus Waterloo's wide range line and fast service on specials, are good reasons why it pays to install Waterloo units in your next job.

Write for Waterloo Catalog, containing complete data.

WATERLOO

REGISTER CO., INC.

WATERLOO, IOWA

WR-103

REGISTERS • GRILLES • VOLUME CONTROL DAMPERS • DOOR VENTILATORS

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ALCO
SOLENOID VALVES

—for trouble-free performance . . .
for every refrigerant control application

LIQUID • SUCTION • HOT GAS
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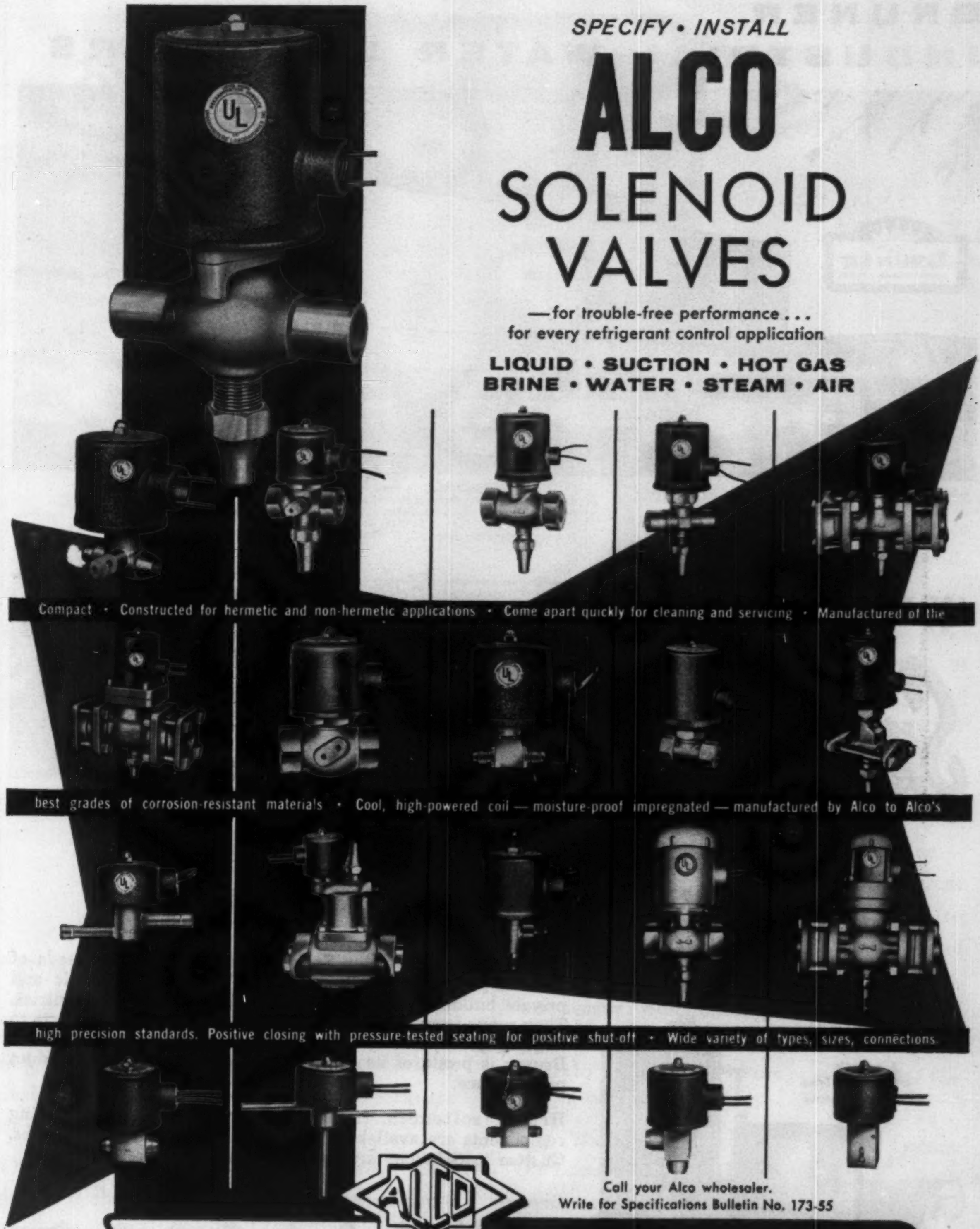

Compact · Constructed for hermetic and non-hermetic applications · Come apart quickly for cleaning and servicing · Manufactured of the best grades of corrosion-resistant materials · Cool, high-powered coil — moisture-proof impregnated — manufactured by Alco to Alco's high precision standards. Positive closing with pressure-tested seating for positive shut-off · Wide variety of types, sizes, connections.

Call your Alco wholesaler.
Write for Specifications Bulletin No. 173-55

- *BUY SECURITY*
- *BUY QUALITY*
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7803

The one complete line of refrigerant controls: Thermostatic Expansion Valves • Refrigerant Distributors Solenoid Valves • Suction Line Regulators • Flooded Evaporator Controls and Reversing Valves

BRUNER
INDUSTRIAL WATER SOFTENERS

BRUNER
WATER SOFTENERS & FILTERS
FAMOUS-BARR

FAMOUS-BARR BUILDING A in Northland Shopping Center, at Jennings, near St. Louis, Mo.
Consulting Engineers: Ferris & Hamig, St. Louis, Mo.
Architect: Russell, Mullgardt, Schwarz & Van Hoefen, St. Louis, Mo.
Consultants: Marx, Flint & Schonne, Chicago, Ill.
Plumbing Contractor: Thomas J. Sheehan Co., St. Louis, Mo.

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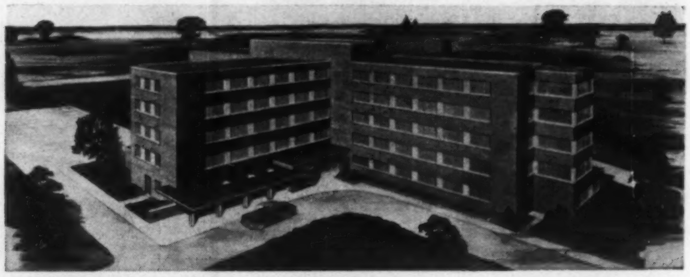
BY LEADING ENGINEERS FOR IMPORTANT INSTALLATIONS!



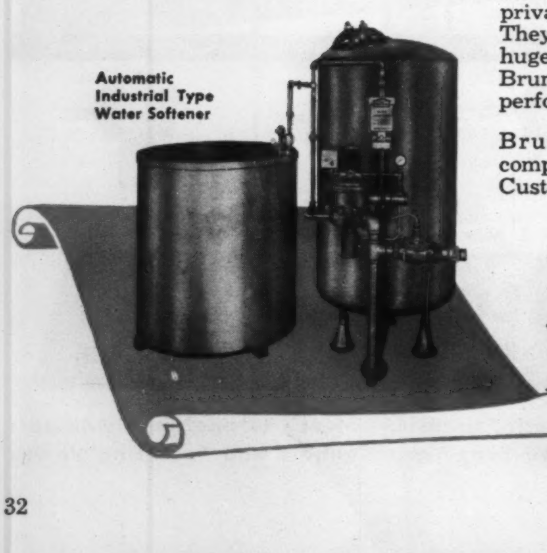
COMMUNITY HOSPITAL, Indianapolis, Ind.
Engineer: J. M. Rotz Engineering Co., Indianapolis, Ind.
Architect: Daggett, Naegele, Daggett, Inc., Indianapolis, Ind.
Plumbing Jobber: Crane Co., Indianapolis, Ind.
Plumbing Contractor: Freyn Bros., Indianapolis, Ind.

PANTEX ORDNANCE PLANT, St. Francis, Tex.
Engineer & Contractor: Silas Mason Co., Amarillo, Tex.

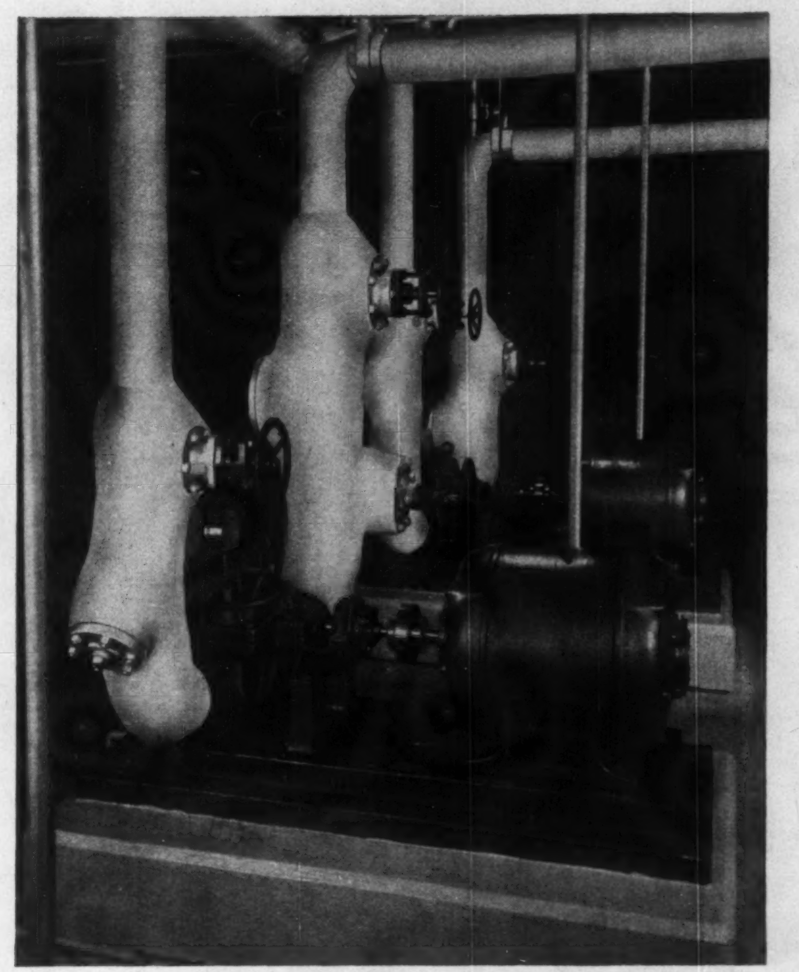
Bruner Industrial Water Softeners are meeting the needs of these important installations and in many other public and private buildings in all 48 states and seven foreign countries. They range from small laundries, schools, motels and resorts to huge hospitals, hotels, factories and atomic energy plants. Bruner is proud of its customer service — famous for product performance.

Bruner softeners, filters and other water conditioning components are available from stock in many types and sizes. Custom installations are fabricated to exact specifications.

Automatic Industrial Type Water Softener



BRUNER CORPORATION
America's most complete line of quality water softeners and filters
Executive Offices: 4763 N. 32nd St., Milwaukee 9, Wis.
Telephone: HIlltop 2-3200
Plants: Milwaukee, Wisconsin, and Los Angeles, California
Sales and Engineering Offices in all principal cities.



"Buffalo" Class "RR" Two-Stage Pumps

THEY PUMP MORE WATER AT LOWER COST

TESTIMONIALS from satisfied users prove the outstanding performance record of "Buffalo" Class "RR" Single Suction Multistage Pumps. These sturdy pumps are specially designed for high pressure and temperature clear water conditions.

The constant hydraulic balance of the "RR" design is the key to the high efficiencies these pumps deliver on the job.

Rugged construction, generous bearings, extra-deep stuffing boxes — all add up to peak performance and long-lived dependability.

"Buffalo" Class "RR" Pumps are available in two and four-stage models, and in a variety of sizes to suit your needs. You will find them a best buy for any clear water service — hot or cold, at pressures up to 1500 ft. heads and at capacities from 20 gpm to 900 gpm.

Your nearby "Buffalo" Engineering Representative will be glad to show you the advantages of "Buffalo" Class "RR" Pumps — or write for Bulletin 980-E.

Every "Buffalo" product brings you the famous "Q" Factor — the built-in QUALITY which provides trouble-free satisfaction and long life.

BUFFALO PUMPS
DIVISION OF BUFFALO FORGE CO.
171 Mortimer Street • Buffalo, N. Y.
Canada Pumps, Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

Modernized

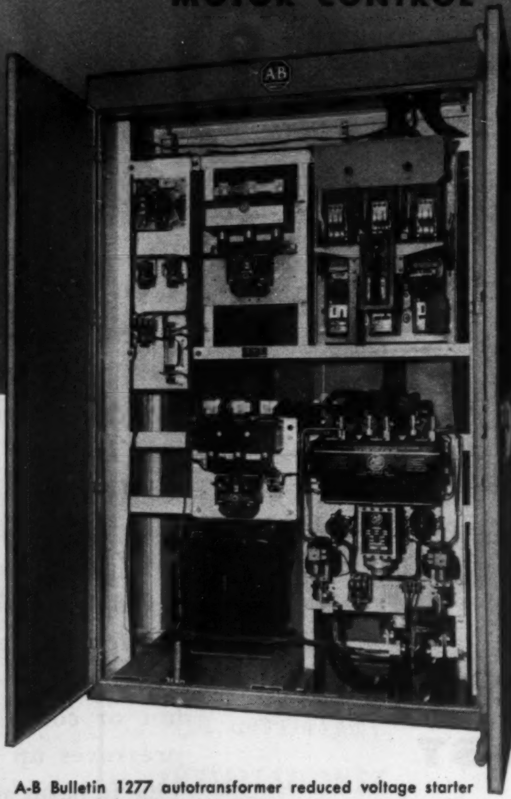
Canal-Randolph Bldg. *uses*

ALLEN-BRADLEY

QUALITY

MOTOR CONTROL

Canal-Randolph Building, Chicago, recently modernized, has installed a new [illegible] to provide up-to-date office space.



A-B Bulletin 1277 autotransformer reduced voltage starter with closed circuit transition meets power company requirements for acceleration without heavy current surges.

Consulting Engineers: Brooke & Choporis.
Air-Conditioning Contractors: Gallaher & Speck.
Electrical Contractors: Hultgren Electric Corp.
Managing Agent: Hogan and Farwell, Inc.

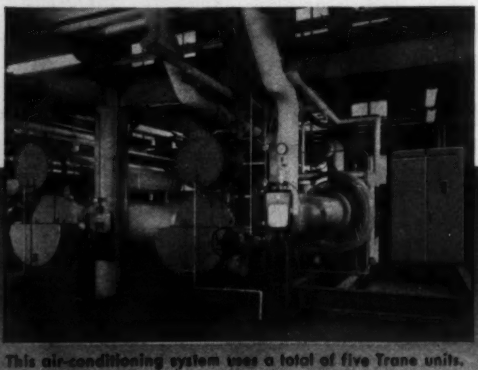
Where *quality*—not necessarily the lowest price—is the most important requirement, you'll find Allen-Bradley quality motor control in use.

The simple solenoid design—which *only* Allen-Bradley offers in *all* starters up through Size 7—has only *one* moving part. This assures *millions* of trouble free operations. There are no bearings to corrode and stick . . . no flexible jumpers to wear and break. Also, the double break, silver alloy contacts—*standard* throughout Allen-Bradley control—never need maintenance. They are always in perfect operating condition. This is why you can install Allen-Bradley control . . . and forget it.

Be sure to specify Allen-Bradley motor control by name . . . it's a decision you will never regret . . . the A-B trademark is your guarantee of years of reliable, trouble free service.

Allen-Bradley Co., *1335 S. First St., Milwaukee 4, Wis.*
In Canada—*Allen-Bradley Canada Ltd., Galt, Ont.*

A-B
QUALITY



This air-conditioning system uses a total of five Trane units. Each of these 400-ton units is equipped with an A-B Bulletin 1277 starter to operate the 440 v compressor motor.

A-B Bulletin 712 combination starters are used to operate the auxiliary pump motors. These are listed in the A-B Handy Catalog. Send for your copy.

DATA SHEET NO. 3

Why to specify the Field Triple-Fuel M+MG2 Draft Control for industrial gas-fired furnaces and boilers

For efficient gas-fired operation, an all-fuel industrial furnace or boiler needs the draft assistance of a chimney, with the draft precisely controlled and fully adjustable. A draft hood cannot provide this, but the Field M+MG2 can. Here is a preformance comparison:

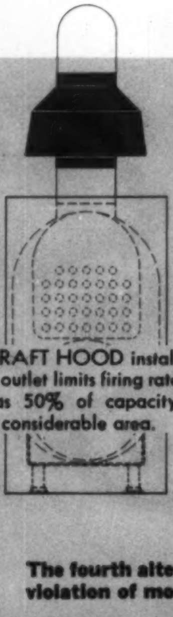
FIRING RATES: A draft hood, installed at the smoke outlet, reduces draft in the breeching to essentially zero. To avoid incomplete combustion, the furnace or boiler must therefore be gas fired at a rate substantially below capacity — frequently 50% less. As a result, the equipment must be oversized in order to meet load requirements. In contrast, the Field M+MG2 permits draft settings as low as .002″ and as high as from .2″ to .5″, depending on size, permitting a full range of firing rates.

DRAFT LOSSES: A draft hood can be installed in the breeching, at sufficient height to develop a high draft, and permit a high firing rate. However, the hood cannot control draft. As a result, any position that provides enough draft for intermittent firing will produce an excessive draft during prolonged high-fire periods. The result is to dilute gases, and thereby waste fuel. In contrast, the Field M+MG2 can be adjusted to hold drafts at a precise setting under all conditions.

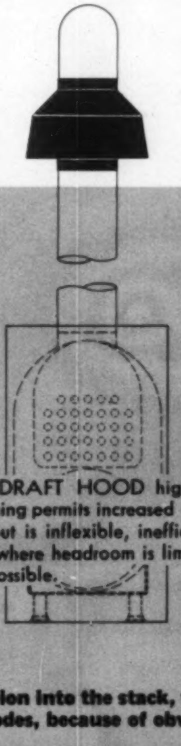
SPACE REQUIREMENTS: Even a comparatively small smoke outlet — a 12″ diameter — requires a draft hood 25¼″ x 24″ x 20″, and an inflexible requirement as to location. This bulk can present a serious problem. The 12″ Field M+MG2, in contrast, occupies only a 13¼″ x 15⅛″ area and permits a wide range of approved locations.

CHANGING LOAD REQUIREMENTS: Draft hoods permit no real flexibility in firing rates to meet changes in load requirements. The installation of a diverter at the smoke outlet automatically limits firing rates, and the diverter installation must be moved or restricted to permit an increase or decrease in efficient firing rates. In contrast, the Field M+MG2, provides for settings as low as .002″ and as high as .5″, permitting the maximum range in firing rates.

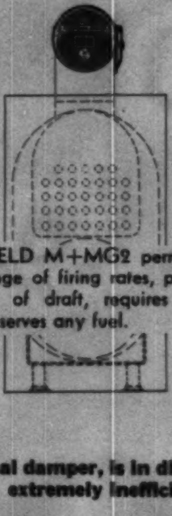
Remove and file for reference.



1 — DRAFT HOOD installed at smoke outlet limits firing rate to as little as 50% of capacity, occupies considerable area.



2 — DRAFT HOOD high in breeching permits increased firing rate, but is inflexible, inefficient, and, where headroom is limited, is impossible.



3 — FIELD M+MG2 permits a full range of firing rates, precise control of draft, requires little space, serves any fuel.

Perforated for easy tear-out.

The fourth alternative, a direct connection into the stack, with or without a manual damper, is in direct violation of most city and gas utility codes, because of obvious hazards. It is also extremely inefficient.

GAS-OIL FIRING: Wherever a gas installation must be altered, to handle oil as an alternating or stand-by fuel, a draft hood is immediately obsoleted, and so, in fact, is a single-fuel barometric draft control. Only the M + MG2 Field Triple Fuel Control is approved for all fuels.

SWITCHES: A draft hood provides relief for down draft pressures, but gives no visual sign of spillage. The double-acting M + MG2 gate opens outward to relieve such pressures, and by its position signals any spillage. In addition, the M + MG2 can be equipped with an automatic switch where the engineer finds conditions which could create frequent and prolonged down drafts. A time delay switch is usually recommended for an atmospheric burner; a thermal switch for a power burner. These switches provide an obvious means to measure the extent of a down draft problem so that an engineer can judge if and when some remedial action is indicated.

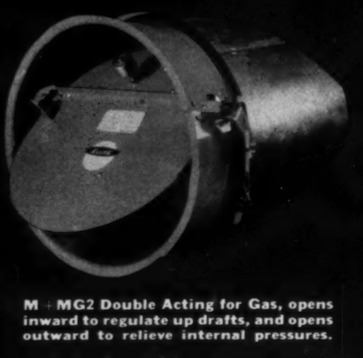
SPILLAGE: A cause of recurrent spillage, where a draft hood is used, is loss of prime resulting, during off-fire periods, from the abrupt cooling of the stack by an unrestricted volume of boiler room air. Then, when the burner comes on, there is a spillage of gases until the chimney is again fully primed. This condition is aggravated by a low stack, or a prolonged off-fire period. The Field M + MG2, in contrast, does not introduce any boiler room air into the stack until or unless draft is in excess of requirements, and therefore the chimney does not lose its prime between normal industrial firing periods.

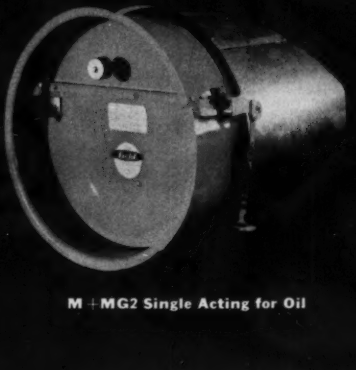
APPROVAL REQUIREMENTS: The M + MG2 is Listed by Underwriters' Laboratories as a single-acting control for solid fuels and oil, and as a double-acting control for gas. It has the approval of America's leading gas utilities, and of America's leading cities where codes apply.

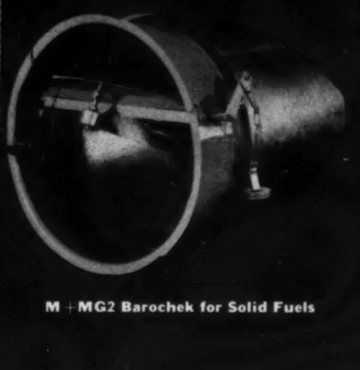
A CONTROL OF UNMATCHED QUALITY: Recognizing that gas is a critical fuel, the M + MG2 is built to maximum standards, and is virtually impervious to wear. The ring is die-formed, for maximum strength. The gate is the heaviest made — 39 pounds for a 32 inch control — and is mounted on a stainless steel knife edge. The bearings are self-cleaning — soot cannot accumulate, and are self-aligning to distribute wear over a wide area. Thus mounted, the gate is essentially friction-free, providing extreme sensitivity both to internal and external pressures. The Field M + MG2 can be installed with complete and absolute confidence.

Data Sheet No. 4 will cover Field Draft Controls for Incinerator Applications.

THE FIELD TRIPLE-FUEL M + MG2 DRAFT CONTROL


M + MG2 Double Acting for Gas, opens inward to regulate up drafts, and opens outward to relieve internal pressures.


M + MG2 Single Acting for Oil


M + MG2 Barochek for Solid Fuels

FIELD CONTROL DIVISION

H. D. Conkey & Company, Mendota, Illinois

AFFILIATES:
Conco Building Products, Inc. • Brick, Tile, Stone — Conco Materials Handling Div. • Cranes, Hoists

Represented in Canada by Ontor Limited, 12 Leswyn Road Toronto 19, Ont., Canada

Crimp, Bead and Lock-Seam USS Galvanized Steel Sheets

—the zinc stays on

Pittsburgh Sheet Metal Duct Company uses USS Galvanized Steel Sheets for their complete line of ductwork. That's because they want nothing but the best.

Pittsburgh Sheet Metal Duct Company buys USS Galvanized Steel Sheets in coils. Then they shear to length, bend, crimp and punch, roll, bead and lock-seam the galvanized steel. And no zinc flakes off the base metal.

You can get the same superior results in *your* ductwork when you use USS Galvanized Steel Sheets.

USS is a registered trademark

United States Steel Corporation – Pittsburgh
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Tennessee Coal & Iron – Fairfield, Alabama
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United States Steel Supply – Warehouse Distributors
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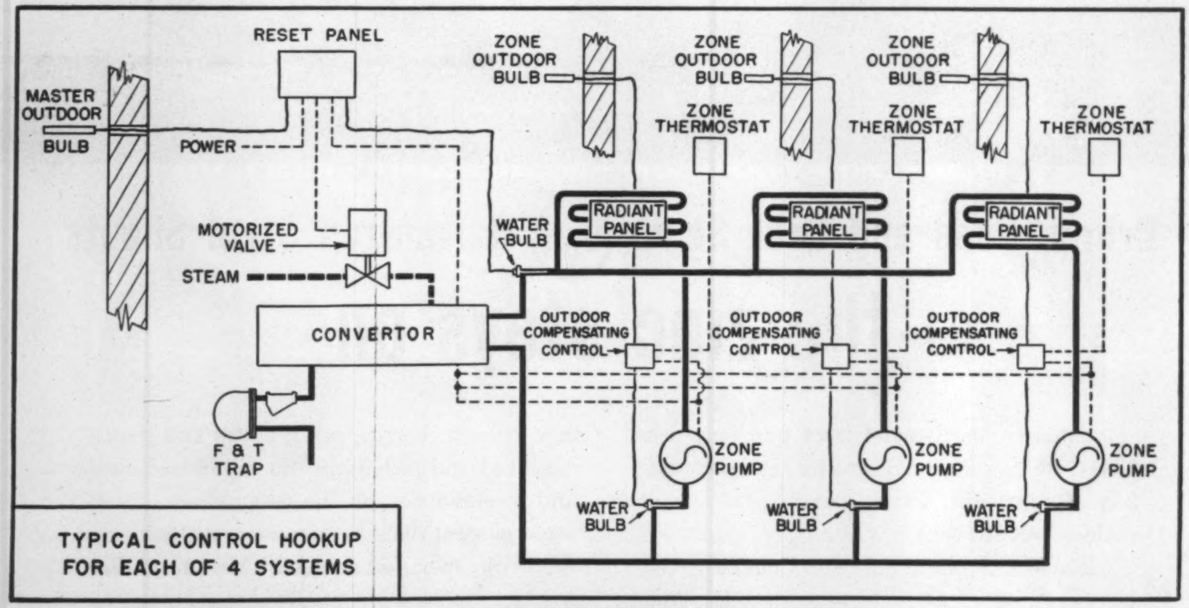
USS United States Steel

Simple, economical solution of complex heating control problem

...FOR NEW 1000-BED HOSPITAL

Highlights of this SARCOTHERM CONTROL SYSTEM

1. Provides *automatically controlled* heating comfort for 13 separate radiant heating zones.
2. Maintains uniform inside temperature in each zone by *automatically adjusting* flow of hot water through system to compensate for changes in outdoor temperature and room load demand.
3. *Automatically controls* flow of steam to each of 4 heat exchangers, varying temperature of hot water supplied to each radiant heating system in response to outdoor temperature changes.
4. *Combines simplicity* with accuracy and dependability . . . instruments are simple, rugged . . . easy to adjust and maintain.
5. *Insures low installed cost* . . . because of fewer controls, less wiring.

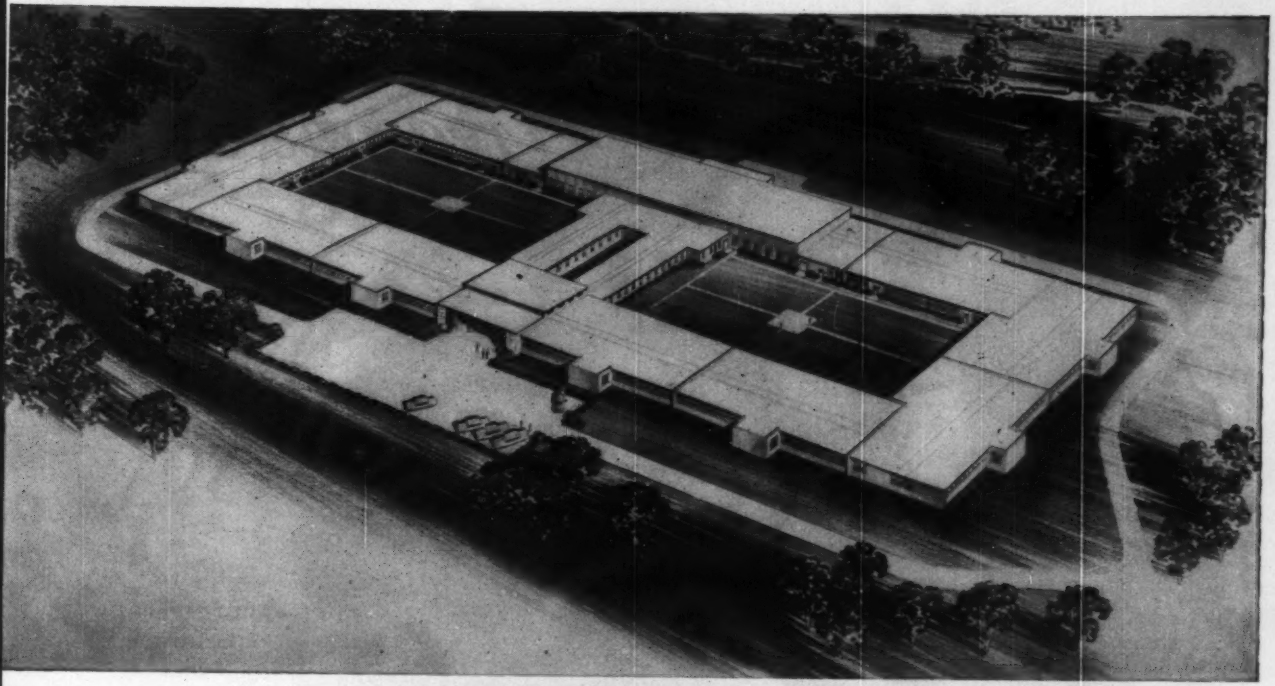

RESET PANEL
MASTER OUTDOOR BULB
POWER
MOTORIZED VALVE
STEAM
CONVERTOR
F & T TRAP
ZONE OUTDOOR BULB
ZONE OUTDOOR BULB
ZONE OUTDOOR BULB
ZONE THERMOSTAT
ZONE THERMOSTAT
ZONE THERMOSTAT
WATER BULB
RADIANT PANEL
RADIANT PANEL
RADIANT PANEL
OUTDOOR COMPENSATING CONTROL
OUTDOOR COMPENSATING CONTROL
OUTDOOR COMPENSATING CONTROL
ZONE PUMP
ZONE PUMP
ZONE PUMP
WATER BULB
WATER BULB
WATER BULB

TYPICAL CONTROL HOOKUP FOR EACH OF 4 SYSTEMS

UNDIVIDED RESPONSIBILITY

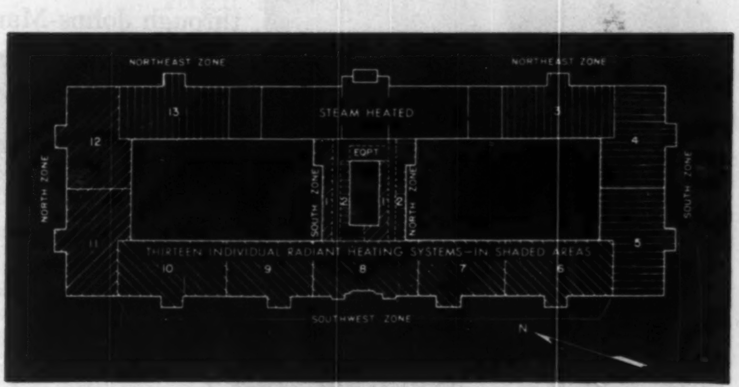
Complete weather-compensated control system plus heating specialties from one dependable source. **In addition to Sarcotherm control system components illustrated above, Sarcotherm and Sarco products installed include Sarcofin radiation, thermostats, balancing fittings with access boxes, radiator valves, thermostatic steam traps, Thermo-Dynamic steam traps and other accessories.**

WEATHER-COMPENSATED CONTROL SYSTEMS FOR



Milledgeville State Hospital, Milledgeville, Georgia
1000-bed Psychiatric Building No. 2

Equipped with Sarcotherm Weather-Compensated Control System for radiant heating. **Architects** — Gregson & Associates, Atlanta, Ga. **Mechanical Engineers** — Ammons, McClure & Caldwell, Atlanta, Ga. **General Contractor** — Jordan Contracting Company, Columbus, Ga. **Mechanical Contractor** — Spivey Plumbing & Heating Co., Dublin, Ga.


NORTHEAST ZONE
NORTHEAST ZONE
13
STEAM HEATED
3
12
4
EQPT
NORTH ZONE
SOUTH ZONE
1
15
14
2
NORTH ZONE
SOUTH ZONE
11
5
THIRTEEN INDIVIDUAL RADIANT HEATING SYSTEMS—IN SHADED AREAS
10
9
8
7
6
SOUTHWEST ZONE
N

Details of heating system

Building supplied with medium pressure steam from boiler house about 3000 feet away.

Steam supplies direct heat to unit heaters (black area) and indirect heat, through four heat exchangers, to 13 individual floor type radiant heating systems (shaded areas), each of which has its own pump.

Radiant heating systems consist of serpentine coils of ¾ inch wrought iron pipe imbedded in the concrete floor.

OTHER ADVANTAGES OF SARCOTHERM SYSTEMS

Application engineering — Sarcotherm engineers, backed by years of experience in heating control systems, assist consulting engineers with individualized system diagrams.

Easy to install — special installation drawings and diagrams of the complete system are furnished for each job.

Easy to maintain and adjust — by regular maintenance men, because of construction simplicity, fewer parts.

On-the-job assistance — to contractors from Sarcotherm's field engineers.

★ ★ ★

FOR COMPLETE CONTROL SYSTEM CATALOG, write . . . Sarcotherm Controls, Inc., 635 Madison Avenue, New York 22, N.Y.

Sarcotherm

AN AFFILIATE OF SARCO CO., INC.

4011-B

STEAM, HOT WATER AND RADIANT HEATING

8 reasons why

Now! Fibrocel made even better through Johns-Manville Insulation Research

JOHNS-MANVILLE JM PRODUCTS

Apply Fibrocel to all hot and cold water pipes, dual service and steam lines from 35F to 300F in buildings like these:

Schools and Colleges

FIBROCEL® PIPE INSULATION

is the new standard for all commercial service

J-M Fibrocel has been the outstanding insulation in the low pressure field ever since its introduction three years ago. Now thanks to new findings by Johns-Manville's insulation research, it is even better in many ways. Today you get all these advantages in Fibrocel insulation:

Cleaner, sharper edges . . . Tight, snug-fitting edges provide better heat control, smoother appearance.

Smoother, harder surface . . . Normal abrasion and abuse in service cannot damage surface.

Firmer, stronger structure . . . Fibrocel resists compression and abuse. Gives back-up protection against puncture of jacket or vapor seal.

Heavier, smoother canvas . . . New canvas covering provides maximum protection and appearance.

plus these features always associated with Fibrocel:

No shrinkage . . . Joints stay tight . . . no unsightly gaps or costly repairs.

Easy to install . . . Fibrocel is light and easy to handle, is readily cut with a knife.

High thermal effectiveness . . . Tiny particles of silica are exploded and expanded to form a cellular structure of heat-trapping dead air spaces.

Permanent . . . Fibrocel is impervious to flame, rot, odor and vermin attack.

Write for free illustrated 8-page folder, IN-155A. It includes physical properties, insulating characteristics, sizes and thicknesses available. Address Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

JOHNS-MANVILLE INSULATIONS

FOR LASTING THERMAL EFFICIENCY

Hotels and Apartment Buildings

Stores and Warehouses

Office Buildings

Hospitals and Institutions

A.I.A. File No. 37-D-1-2

WAYS TO ARRIVE AT PROPER VENTILATION

No two ventilating systems are likely to be exactly the same. Conditions vary; so should the fans. The six examples illustrated here cover the situations most often encountered in industrial plants.

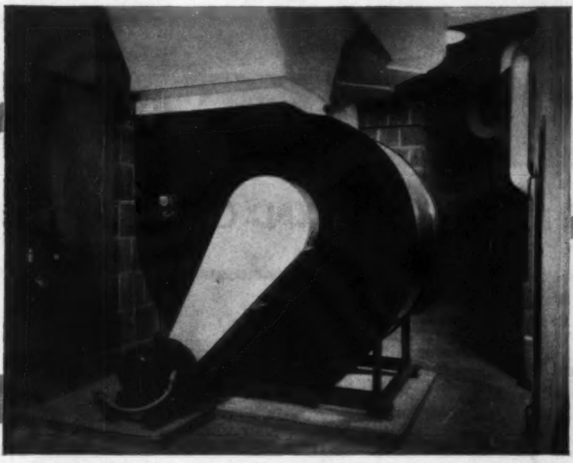
In many instances, the right combination of ventilating installations can go a long way toward modernizing existing buildings.

Better working conditions usually result in improved morale and greater worker efficiency.

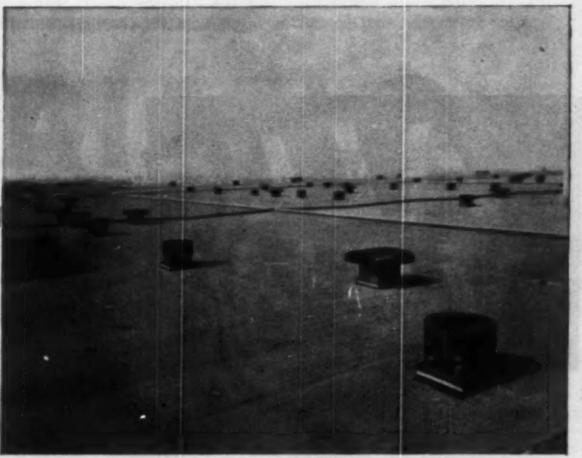
While complete air conditioning is desirable, and in many cases absolutely necessary from a manufacturing standpoint, adequate ventilation many times will do a satisfactory job.

And for the best in ventilating fans, contact your local "Buffalo" Engineering Representative or write:

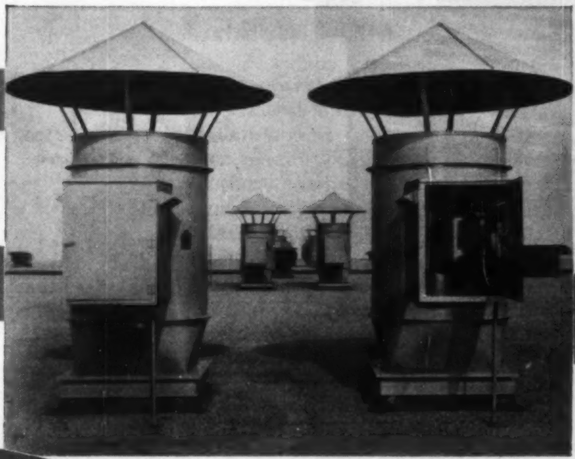
BUFFALO FORGE COMPANY, Buffalo, New York



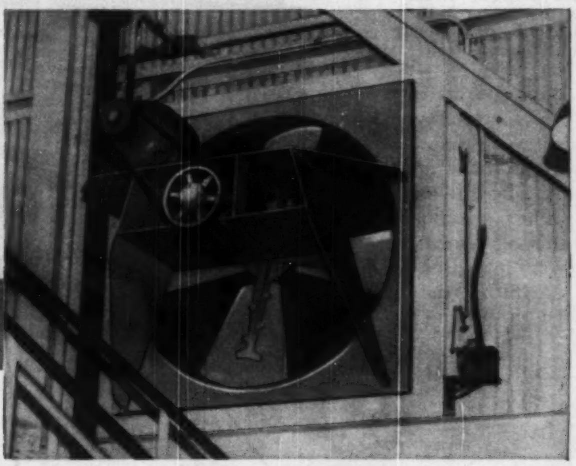
CENTRAL SYSTEM ventilation, which very often incorporates air conditioning and heating, requires the high efficiencies and capacities of large centrifugal fans. Capacities range to 500,000 cfm.



THROUGH THE ROOF is the best way to ventilate large areas where duct work is undesirable. Allows flexibility of plant layout. New models in capacities up to 250,000 cfm.

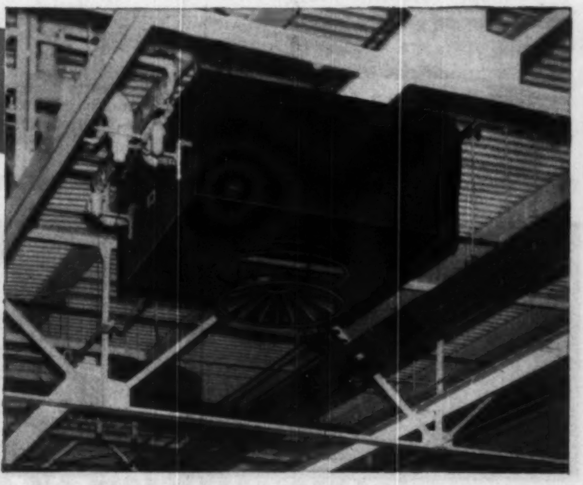


CONFINED AREA exhaust such as spray booths, hood installations, function best with efficient, powerful axial flow fans. Units easily installed in ducts.



LOWEST COST ventilation for open areas is made possible by large propeller fans. New designs offer higher efficiencies, larger capacities (250,000 cfm).

CORROSIVE FUMES can be exhausted with cast iron fans as shown. Also available are fiber glass fans, rubber and other specially coated units.

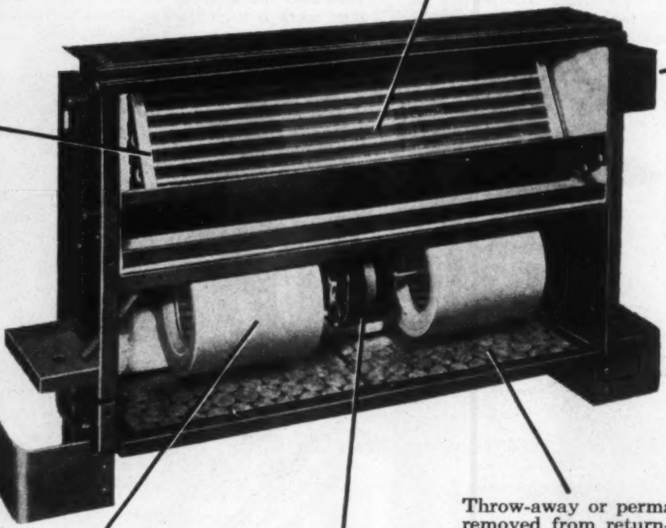


PUTTING BACK AIR exhausted is job for low cost, high capacity make-up air units. Fans, heating coils, filters, diffusers included in "package" units.

ALL NEW

AMERICAN

FAN-COIL-TYPE



Universal coil—provides summer cooling and dehumidifying with chilled water, and hot-water heating in winter

Reversible coils—easily removed on the job for opposite-hand connections

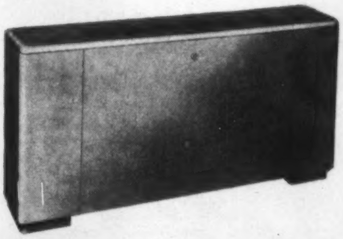
Individual room control readily accessible

Available in four sizes: 200, 300, 400, and 600 cfm

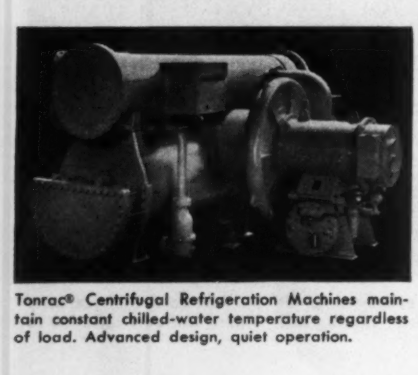
Throw-away or permanent filters easily removed from return-air opening without removing casing

Motor furnished with 3-speed control

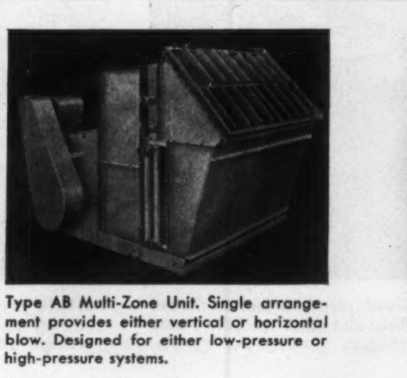
Lightweight aluminum fans provide long bearing life



Enclosure for Diaflo room air conditioner is made of furniture steel, and can be furnished in a tan-primer or leathertex-enamel finish.



Tonrac® Centrifugal Refrigeration Machines maintain constant chilled-water temperature regardless of load. Advanced design, quiet operation.



Type AB Multi-Zone Unit. Single arrangement provides either vertical or horizontal blow. Designed for either low-pressure or high-pressure systems.

American Blower Packaged Air Conditioners. Sizes from 3 to 20 tons. Air- or water-cooled models for use with or without ductwork.

BLOWER DIAFLO®

UNIT AIR CONDITIONERS

Diaflo units are designed, engineered, and manufactured to meet the professional requirements of each member of the building team

Architect

"They provide the design flexibility and pleasing appearance an architect likes in a unit air conditioner. They adapt readily to both new and existing buildings, with a choice of lengths to fit modularly spaced partitions. Diaflo units are completely suitable for new curtain-wall-type buildings or for other types of construction."

Consulting Engineer

"They're versatile mechanically, too, with rugged, heavy-gauge construction. Two basic units permit either vertical or horizontal installation. Front or top discharge is available on vertical unit. Universal coil permits summer cooling with chilled water, and winter heating with hot water. Coil is suitable for manual, electrical, or pneumatic control."

Mechanical Contractor

"Diaflo units provide a really 'clean' installation. Base unit is easily mounted with free access on both ends for all connections. Installer can work freely without being cramped. This saves time and money. Then just prior to start-up, clean, undamaged enclosure can be hung in place."

Owner

"Diaflo units certainly fit the requirements of modern building air conditioning. They harmonize well with practically any interior decor—are quiet, draft-free, and permit room occupants to select their own temperature. Maintenance is economical, too. Filter removal is easy, and there is ready access to all controls."

You can pinpoint responsibility for equipment performance, delivery dates, user satisfaction on any air-conditioning system you plan by using American Blower equipment . . . the complete line that's designed, engineered, and manufactured to work together. And 73 branch offices offer local product help or nation-wide sales-service coordination. American-Standard,* American Blower Division, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ontario.

* American-Standard and Standard ® are trademarks of American Radiator & Standard Sanitary Corporation.

AMERICAN-Standard

AMERICAN BLOWER DIVISION

Big-tonnage refrigeration news...

Carrier

CENTRIFUGAL COMPRESSORS

with broad application flexibility
now in increased capacities up to

3000 tons

Now, the big-tonnage refrigeration requirements for many large air conditioning and industrial processing applications can be handled economically with a single Carrier Centrifugal Compressor. These multi-stage, heavy-duty centrifugals are designed and built to the same high-quality standards that have earned Carrier the reputation for around-the-clock dependability on thousands of applications.

With unit capacities up to 3000 tons, these Carrier Centrifugal Compressors provide many installation and operating advantages. To mention a few:

Extreme flexibility of arrangement with coolers and condensers. Four of many combinations are illustrated.

High lift or wide temperature range in two, three or four stages.

Side loading for split load requirements.

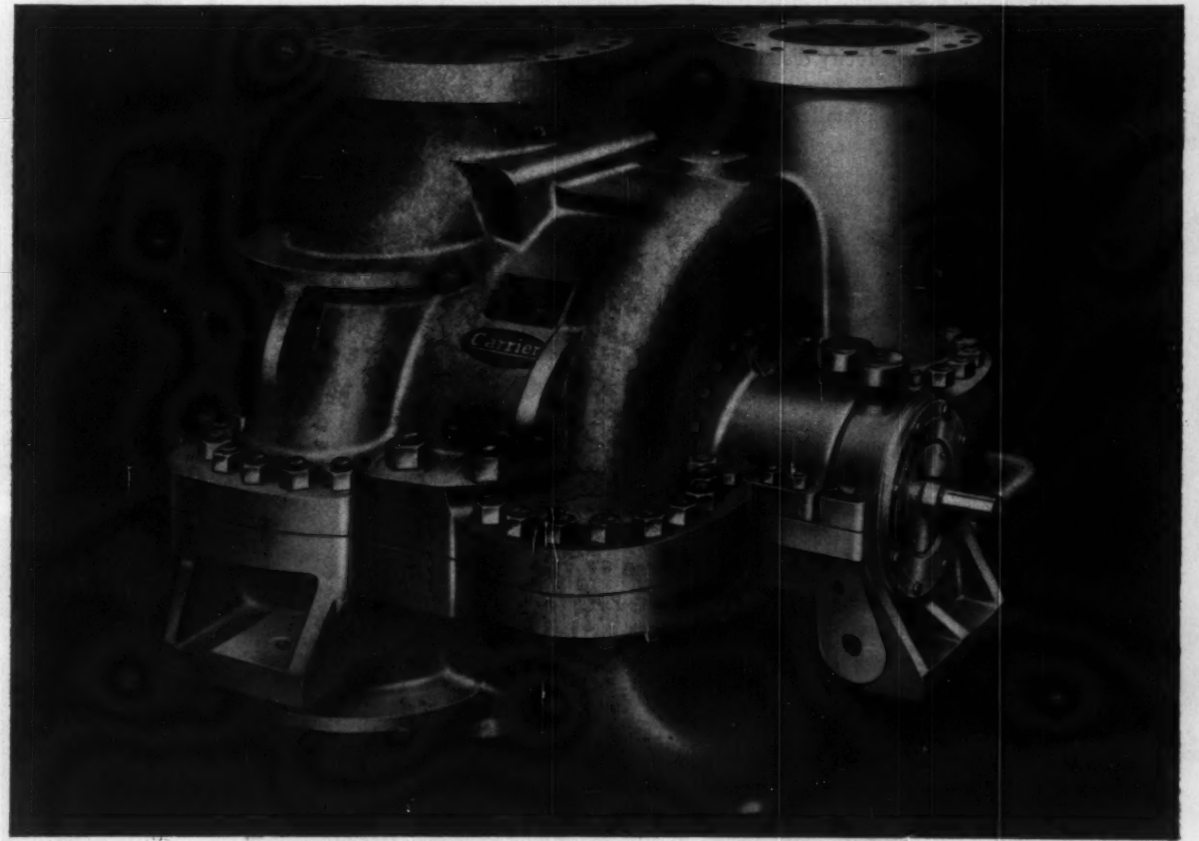
Variable inlet guide vanes for capacity control.

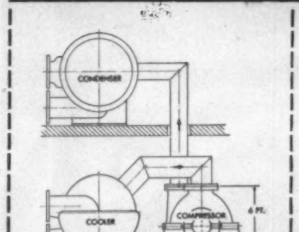
Suitable for all types of drives.

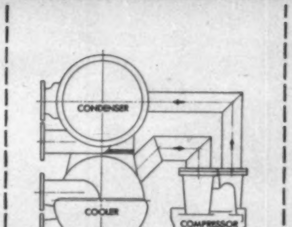
Versatile use with any high-pressure refrigerant.

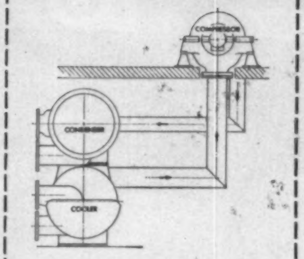
Whatever your requirements, the Carrier specialist in your area can make an impartial recommendation. For information about these big-tonnage Carrier Centrifugals and specific application to your requirements, call your nearest Carrier office, or write

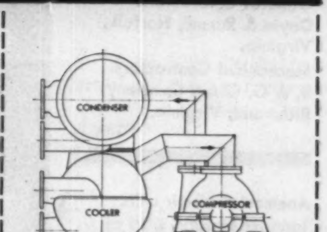
CARRIER CORPORATION, SYRACUSE, NEW YORK











All-Air High Velocity System provides versatile, draftless air conditioning for Smith-Douglass

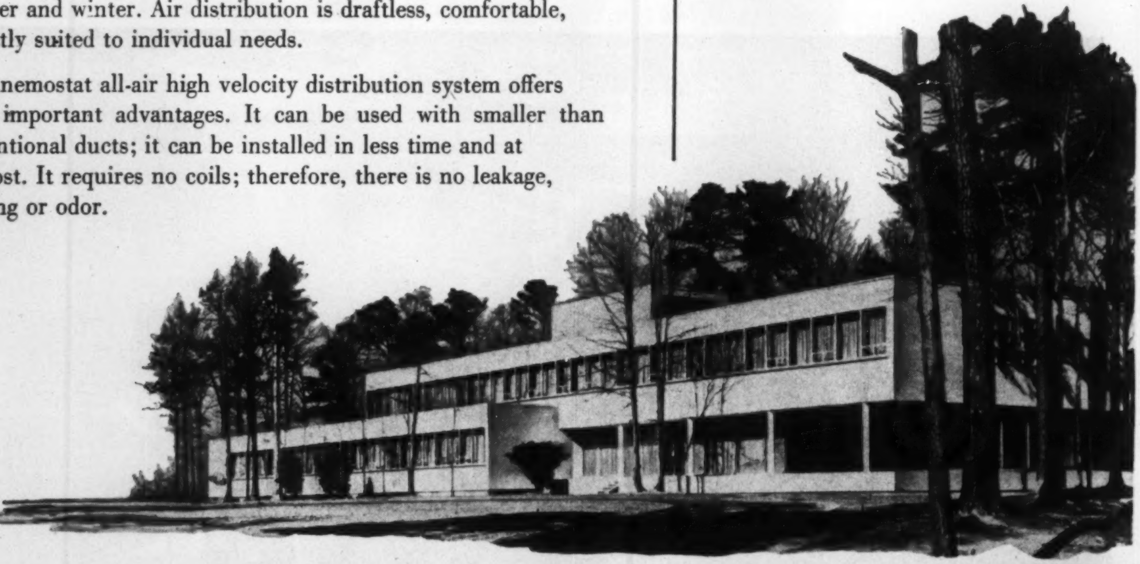
The new office building of the Smith-Douglass Company, leading fertilizer manufacturer, is fully air conditioned with a dual duct Anemostat all-air high velocity system.

Conditioned air is supplied to the Anemostat all-air high velocity units through two parallel ducts—one carrying cold air and the other warm air. The all-air high velocity units draw air from both ducts in any desired proportion to meet the temperature requirements for each area in both summer and winter. Air distribution is draftless, comfortable, perfectly suited to individual needs.

The Anemostat all-air high velocity distribution system offers other important advantages. It can be used with smaller than conventional ducts; it can be installed in less time and at less cost. It requires no coils; therefore, there is no leakage, clogging or odor.

ARCHITECTS—
Attention Please!

Anemostat round, square and straight-line diffusers used with high velocity units can be adapted to a wide variety of architectural designs.



This modern structure is located in Princess Anne County near Norfolk, Virginia.

Architect:
T. David-Fitz-Gibbon, Norfolk, Virginia

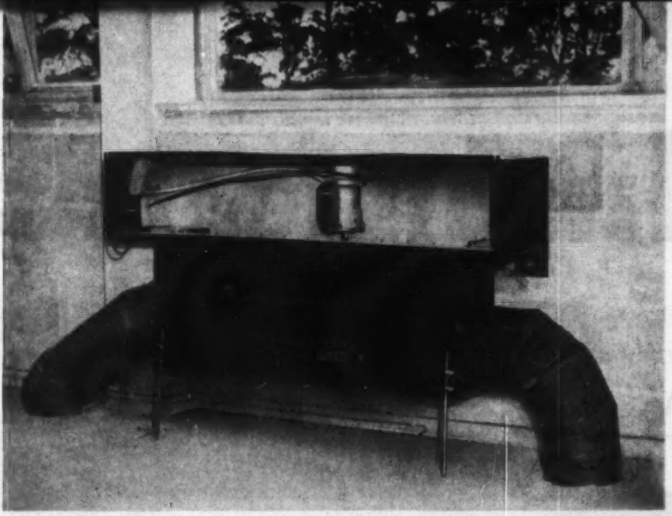
Design Consultant:
Thaddeus G. Crapster, New York.

Consulting Engineer:
J. Robert Carlton, Richmond, Virginia.

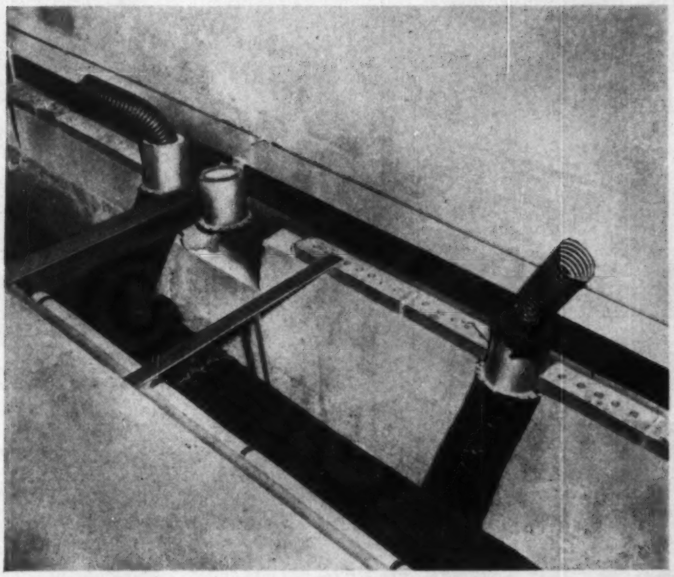
General Contractors:
Doyle & Russell, Norfolk, Virginia.

Mechanical Contractors:
B. & G. Olsen Company, Richmond, Virginia.

Anemostat all-air units form an integral part of the interior design and can be easily combined with built-in cabinets or bookcases. →



Anemostat UTW units before being enclosed.
←



Typical take-offs from main supply duct located in the floor. High velocity ducts can be buried in the floor.
←

Air is perfectly distributed in large meeting room by means of Anemostat ceiling air diffusers.
↓

Meeting room of the Board of Directors. Note Anemostat ceiling and under-the-window units.
↓

Write on your business letterhead for your copy of

Anemostat®
Selection Manual 60

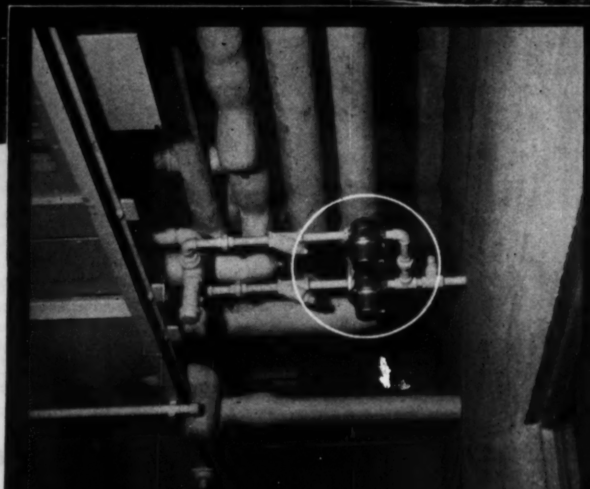
ANEMOSTAT CORPORATION OF AMERICA
10 East 39th Street, New York 16, N. Y.

Anemostat: The Pioneer of All-Air High Velocity Systems

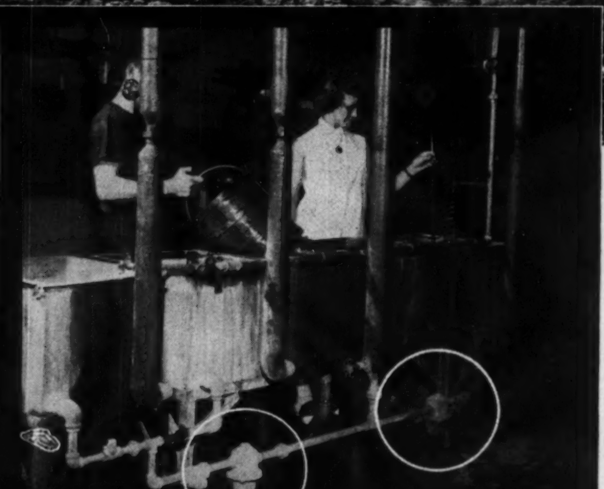
There's a Difference in steam traps!

ILLINOIS TRAPS AT SHEAFFER

SHEAFFER PENS
W. A. SHEAFFER PEN CO.



BUILDING HEATING. Here are two of the Illinois traps at the Sheaffer plant. A switch to Illinois resulted in perfect comfort temperatures and a reduction of more than one fourth in fuel consumption.



PROCESSING. Plant Engineer John Manshein reports that Illinois traps were the *only* traps among those tested that could function properly on these plating tanks.

CUT FUEL BILL 25%
PEN COMPANY PLANT!

Sheaffer Pen Company, Fort Madison, Iowa. Designed and constructed by The Austin Company.

Plant engineer's tests prove Illinois superiority in both building heating and processing operations

THE PROBLEM

After Sheaffer Pen Company built its modern, air conditioned plant at Fort Madison, Iowa, Plant Engineer John Manshein encountered heating problems. He found that some areas of the building could not be brought up to comfortable temperatures.

WHAT WAS DONE

First, Mr. Manshein made a thorough investigation. As a result of this, he ordered six traps from various manufacturers and put them through his own rigid testing program.

RESULT

These tests led to the installation of Illinois traps throughout the building. *During the following heating season, the building was perfectly comfortable and fuel consumption dropped more than one-fourth!*

Processing, Too!

Mr. Manshein conducted his own tests, also, on traps serving the plant's many plating, wash and rinse tanks with the same result—a switch to Illinois. He says that Illinois traps were the *only* traps among those tested that could take the very rapid valve openings and closings for prolonged periods.

Select from a complete line of thermostatic traps, float and thermostatic traps and steam traps—25 inches vacuum to 600 lbs. pressure. Write for booklet, "There's a Difference in Steam Traps"—a case study at Sheaffer Pen Plant.

illinois
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A Division of American Air Filter Company, Inc.

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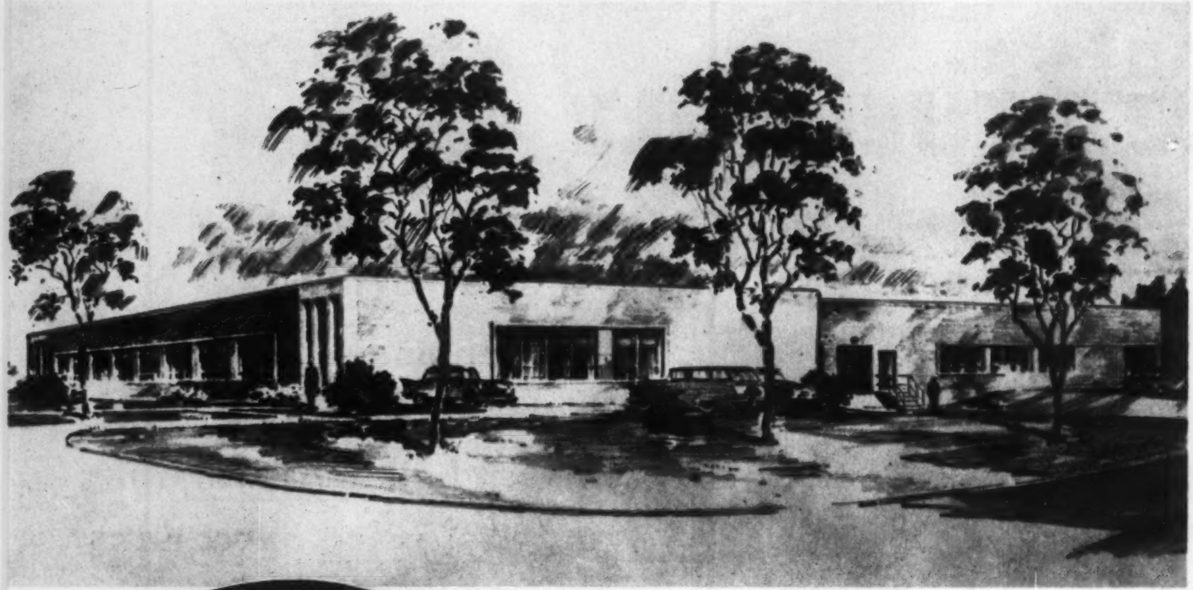

THERMAL... *For Heating and Ventilating*

Raytheon Manufacturing Company, a leading maker of electronic components and systems, employs Thermal Engineering units for heating and ventilating its new, modern plant*, located in the Waltham Industrial Center, Waltham, Mass.

This is just one of many outstanding buildings throughout the country using Thermal equipment, because this equipment can be specified with confidence that it will deliver years of satisfaction. Thermal Engineering manufactures a complete line of central plant and multizone conditioners, sprayed coil units, heating and ventilating units, heating and cooling coils and air-cooled condensers. Your copy of the Thermal Catalog is ready, write for it today.

Agents in principal cities.

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THERMAL ENGINEERING CORPORATION

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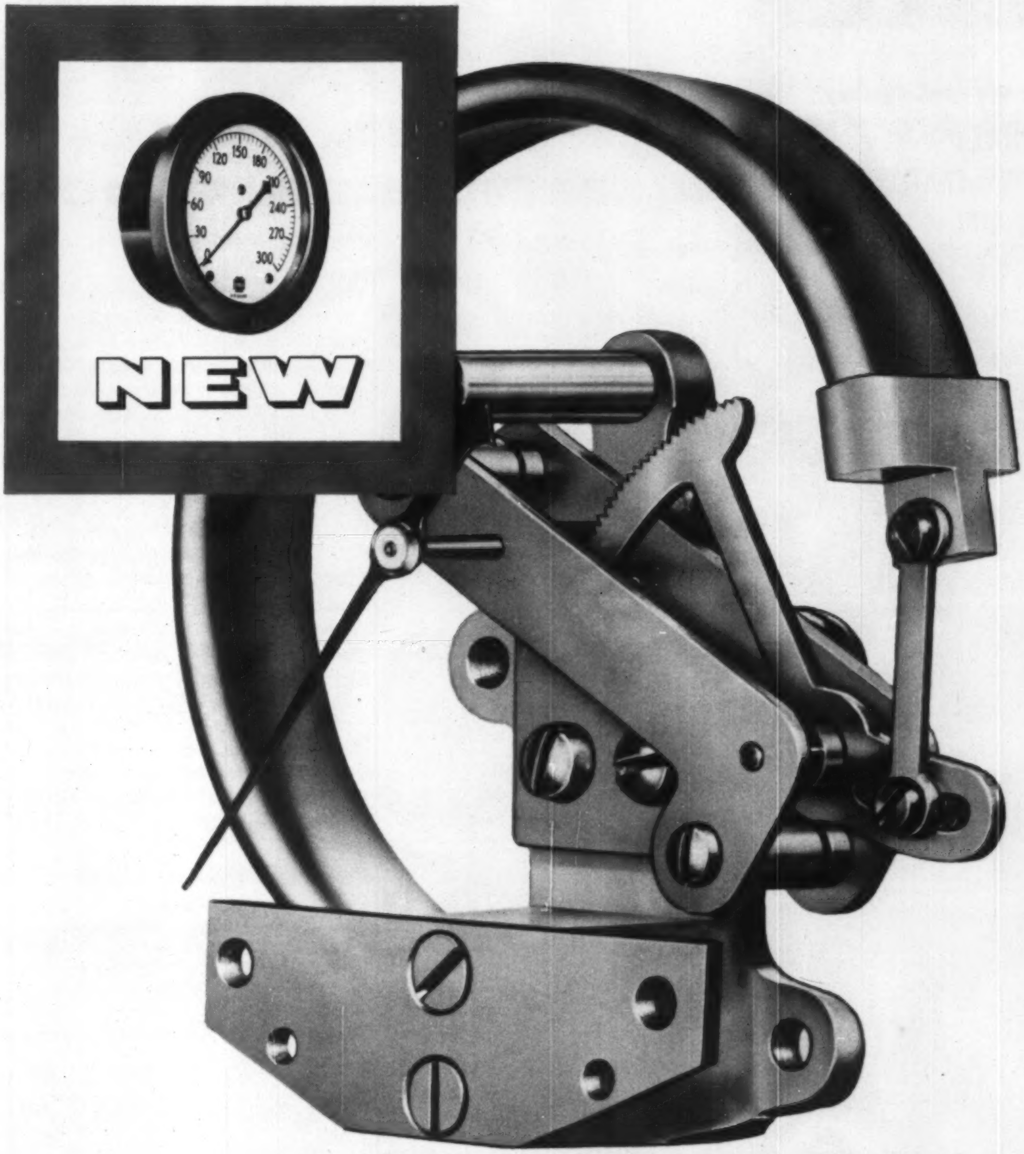
HOUSTON 19, TEXAS

*Engineers: Cabot, Cabot & Forbes Engineering Division, Boston, Mass.
General Contractor: Aberthaw Construction Co., Boston, Mass.
Heating Contractor: Crane Plumbing & Heating Co., Cambridge, Mass.



THE USG "A" LINE—Now, from the nation's largest gauge maker, a complete new line of quality gauges—guaranteed to be the "best buy" on the market in their class!

The new "A" Line gauges are the modern counterparts of USG's utility line, the 500 Series, with many important design improvements.

MEETS A.S.A. GRADE A STANDARDS—Guaranteed accurate within 1% of scale range for middle (working) half of scale. More than adequate for a broad range of industrial applications.

ALUMINUM CASES—Lightweight and corrosion-resistant. Case styles include front flange with hinged cover. Other case materials and a variety of modern designs available.

COMPLETELY REDESIGNED MOVEMENTS—New precision-constructed movements include deep bushed brass and all stainless steel, as well as nylon-stainless steel.

STURDY BOURDON TUBES—Choice of Bourdon tubes, quality-controlled by USG . . . designed for longer life and maximum stability in service.

OPTIONAL EXTRAS—Among numerous options, you can have silver soldered connections for high temperature service . . . non-shatter and plastic glass covers . . . chrome plated rings.

PRICE, IT'S LOW!—You have to *see* the new "A" Line gauges to believe all the quality features they offer at amazingly low costs. Ask your U. S. Gauge distributor for a demonstration today, or write for a copy of new Catalog 305.

UNITED STATES GAUGE USG®

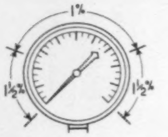
DIVISION OF AMERICAN MACHINE AND METALS, INC., SELLERSVILLE, PA.

if you are looking for

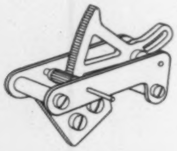
ACCURACY
QUALITY FEATURES
LONG LIFE
EASY MAINTENANCE
LOW COST
GOOD DELIVERIES

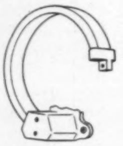
SEEING IS BELIEVING

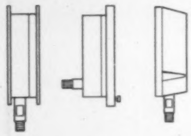
Call your USG Distributor for a personal demonstration of these features

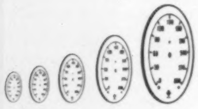


ACCURACY—Guaranteed accuracy within 1% of range for middle half of scale, where readings are generally taken (and 1½% of scale for the remainder). Designed specifically for the thousands of industrial applications which do not require the higher accuracy of Grade AA gauges like USG's SUPERGAUGE (guaranteed within ½ of 1% of scale).









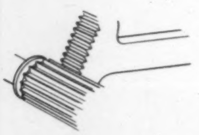
QUALITY FEATURES—You can choose from a variety of design options, many of which are quality components of the SUPERGAUGE line, to meet your application needs. For example:

IN MOVEMENTS: Available movements, so important to sustained performance, include: corrosion-resistant brass . . . heavy-duty, deep bushed brass with stainless steel arbors and pinions . . . all stainless steel . . . or the SUPERGAUGE ARC-LOC (nylon-stainless steel) movement.

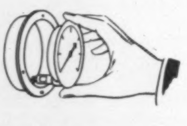
IN BOURDON TUBES: You can choose from such types as phosphor bronze, 403 or 316 stainless steel, with female tip construction and flat tube design. Largest possible size of tube for each case size provides extra strength for maximum life and stability of measurement.

IN CASE DESIGNS: Standard aluminum cases have back or front flange for front of board or panel mounting. Other case materials include cast iron, brass and phenolic resin. Front rings can be peaked (slip or threaded) or hinged.

IN SIZES AND RANGES: Dial sizes are 3½, 4½, 6, 8½, and 12 inches. Pressure ranges go up to 10,000 psi gauge and down to 30 in. Hg vacuum. Compound ranges also available.



LONG LIFE—Design improvements embodied in the "A" Line are based upon U. S. Gauge's 50 years of experience in the making of pressure gauges. Proper selection of available components can assure you long service life through such features as precision "generated" gear teeth for minimum friction and wear . . . extra deep bushed movements where needed . . . corrosion-resistant parts.



EASY MAINTENANCE—Socket, tube, tip, movement, dial, and pointer are removable as one unit.* This "Mono-Unit" construction eliminates possible pointer shift due to stresses at gauge connection . . . makes it easy to remove entire gauge internals for inspection and recalibration. Calibration adjustments are simple and positive.

*Except 3½-inch size

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DIVISION OF AMERICAN MACHINE AND METALS, INC., SELLERSVILLE, PA.

USG®

NEW MULTI-VENT® "*INDUSTRIAL*" AIR DIFFUSER

DELIVERS DRAFT-FREE AIR AT LESS THAN 2½¢ per CFM!

The MV-100 is a low cost air diffuser which will permit a large number of air changes per hour and at the same time provides such quick entrainment that air velocity drops to approximately 50 FPM within the occupied zone.

This means not only draft-free comfort for workers, but also consistently low rates of air motion which will not interfere with production. In addition, the even air distribution delivered by MV-100 can maintain temperature variation within 2 degrees . . . an important factor in "process cooling" for many industries.

Simple to install, the MV-100 air diffusers have a cadmium plate, rustproof finish, and are furnished with built-in volume control valve and air-seal gasket. Write for detailed literature and the name of the Multi-Vent sales and engineering representative in your area.

The RAND McNALLY Company offset printing pressroom. MV-100 industrial diffuser solves critical air distribution problem.

MV-100 Industrial Air Diffuser

the
PYLE-NATIONAL
company
multi-vent division

Where Quality is Traditional
1373 N. Kostner Avenue,
Chicago 51, Illinois

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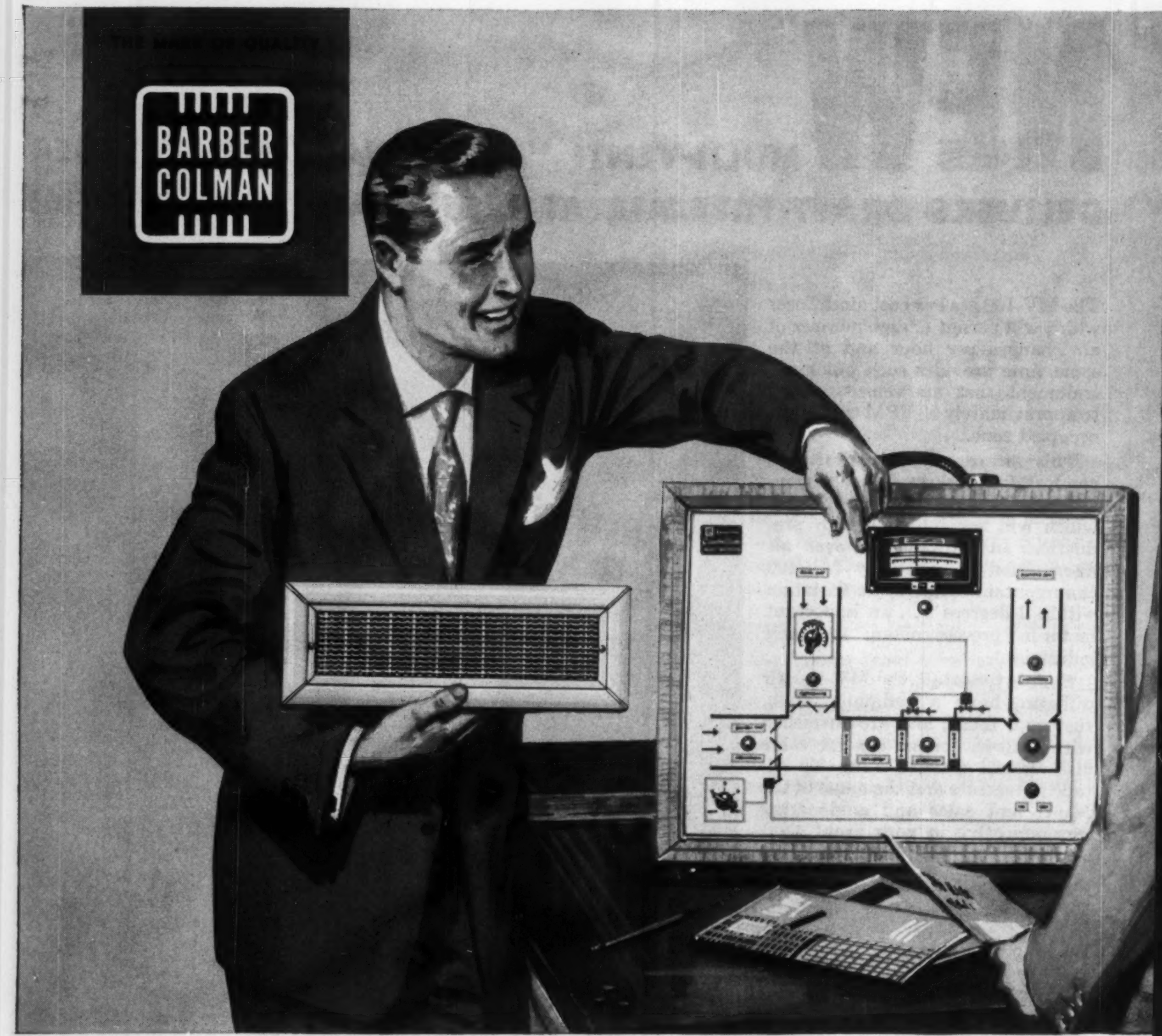
OF THE UNITED STATES AND CANADA



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Just look up "Barber-Colman" in the phone book for any of these cities:

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Toronto
Vancouver
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try Barber-Colman's co-ordinated approach to high comfort standards!

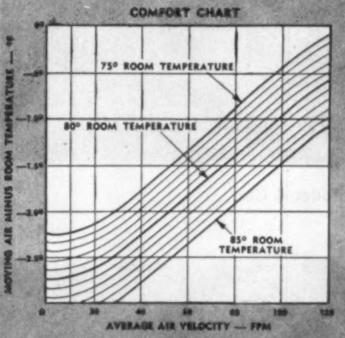
More and more engineers and contractors are learning the value of one responsible source for both Automatic Controls and Air Distribution Products

From first contact until your air conditioning is balanced and checked, your Barber-Colman representative offers co-ordinated products and service on *both* Automatic Controls and Air Distribution.

At the design stage, he provides engineers with invaluable assistance in selection and placement of equipment.

During installation, he checks out control systems and is available for final balancing of the air distribution.

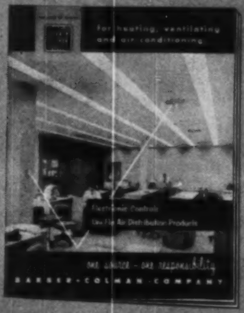
He guarantees not merely the equipment but the final result — a draft-free, ideally controlled system fulfilling today's high comfort standards. Rely on Barber-Colman to help you cope with problems arising from an ever-changing architectural and engineering concept.



COMFORT STANDARDS

This chart developed by Barber-Colman indicates conditions of air movement and temperature in the occupancy zone. Line shown for each average room temperature is limit of satisfactory comfort conditions. Points above the line fulfill Human Comfort Standards. The Barber-Colman "Comfort Engineer" is the one supplier who can assure *proper relationship* of temperatures and air velocities as dictated by this chart. Copies available from your nearby Barber-Colman Field Office on request.

Ask your Barber-Colman Field Office for this new, fully illustrated bulletin detailing advantages of Automatic Controls and Air Distribution system combinations. Just look for the name Barber-Colman in the telephone book for any of the 95 cities listed on the left-hand page of this ad.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Electronic Controls
Uni-Flo Air Distribution Products
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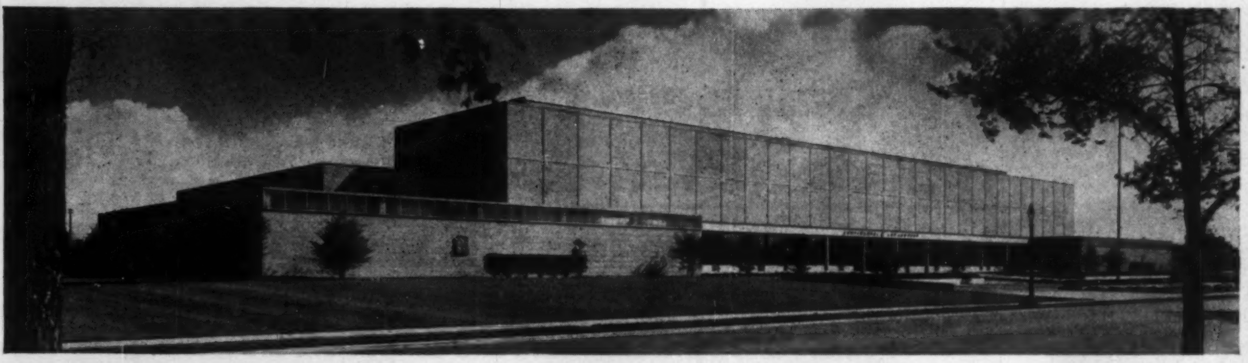
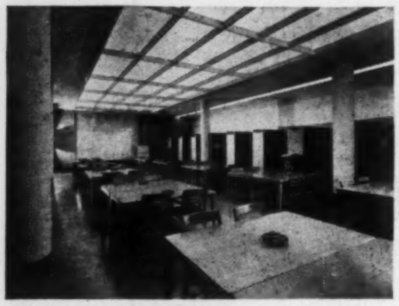
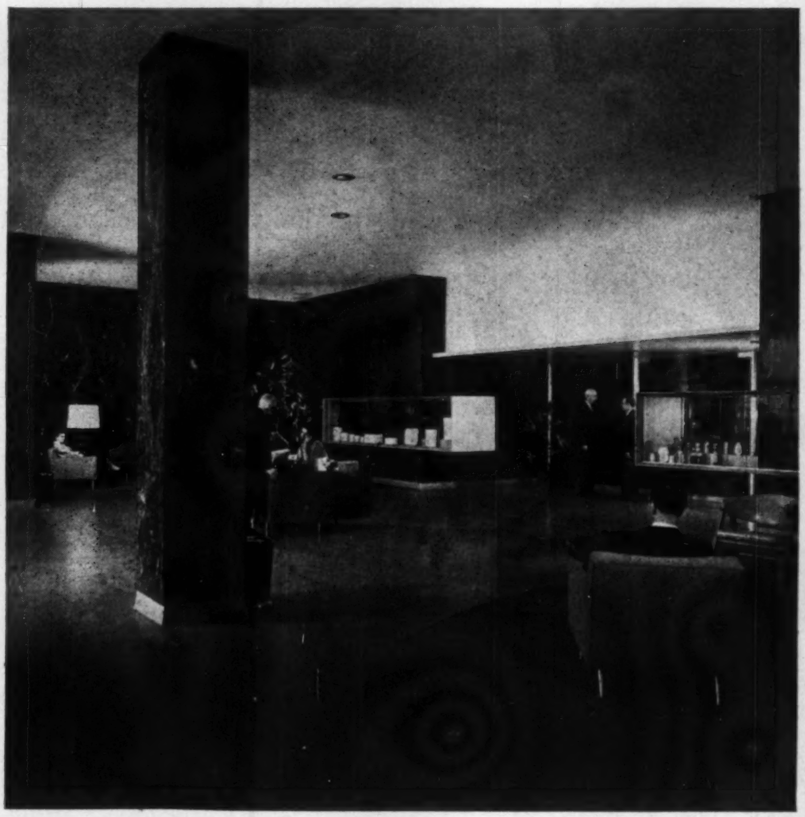


CONTINENTAL CAN CO., INC. / Metal Division, Research & Development Center, Chicago, Illinois

Leading Research Laboratories across the nation depend on Powers for accurate temperature and humidity control in test rooms and work spaces.

Outstanding research library is shown below.





Architects and Engineers: Schmidt, Garden & Erikson, Chicago • **General Contractor:** George A. Fuller & Co.
Contractors: S. J. Reynolds Co., Inc., Chicago • R. R. Hayward Co. • Carrier Corp., Chicago, Ill.

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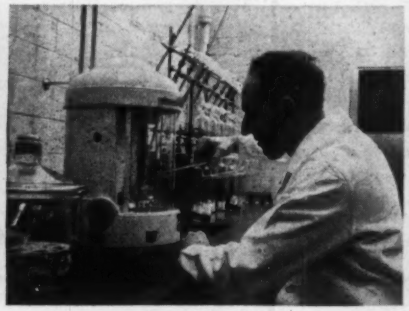
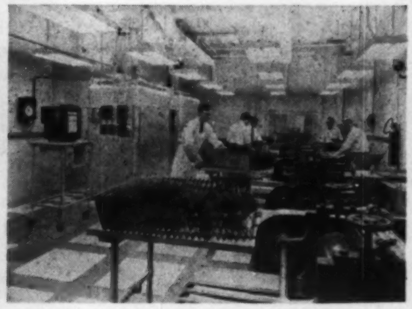
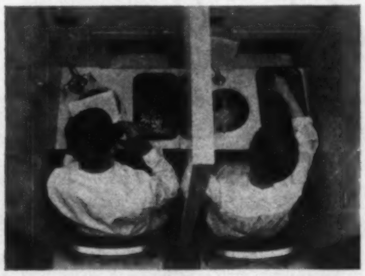




POWERS Air Conditioning Control System helps CONTINENTAL CAN COMPANY Research produce the newest ideas in modern containers

Food-testing kitchen above and impartial tasting panels in Continental Can Co.'s laboratory are accurately held at a constant temperature and humidity by Power's control.



Research experts here are constantly at work making improvements in design, construction, materials and equipment to make better cans for hundreds of products.

Offices, work areas, conference rooms, library, cafeteria, lobby and constant temperature test rooms between −10°F to 130°F are all provided with Powers individual space control.

Central fan systems supply conditioned air to perimeter and interior systems. Under the window type units in the perimeter areas are controlled by Powers Heating-Cooling Thermostats regulating Powers PACKLESS Control Valves. Temperatures at key points throughout the plant are continuously indicated by a strip recorder.

Are You Planning a New Building or modernizing an old one? Solving complex temperature and humidity control problems in this and other prominent laboratories demonstrates Powers engineering skill and know how.

When you ask your architect or engineer to include a Powers Control System you can be sure of TOP QUALITY—there is no better.

Other Prominent Powers Users

- Abbott Laboratories, Inc.
- Argonne National Laboratories
- American Telephone & Telegraph Co.
- Bendix Aviation Corp.
- California Institute of Technology
- Douglas Aircraft Co.
- E. I. DuPont de Nemours Co.
- Esso Research Center
- General Motors Corp.
- B. F. Goodrich Research Labs.
- Humble Oil Co.
- Illinois Inst. of Technology
- Johns Manville Co.
- Massachusetts Inst. of Technology
- Northrop Aircraft Co.
- Park Davis & Co.
- Thompson Products Co.
- U. S. Rubber Co. Labs., Wayne, N. J.
- Western Electric Co.
- Wyeth Laboratories, Radnor, Pa.

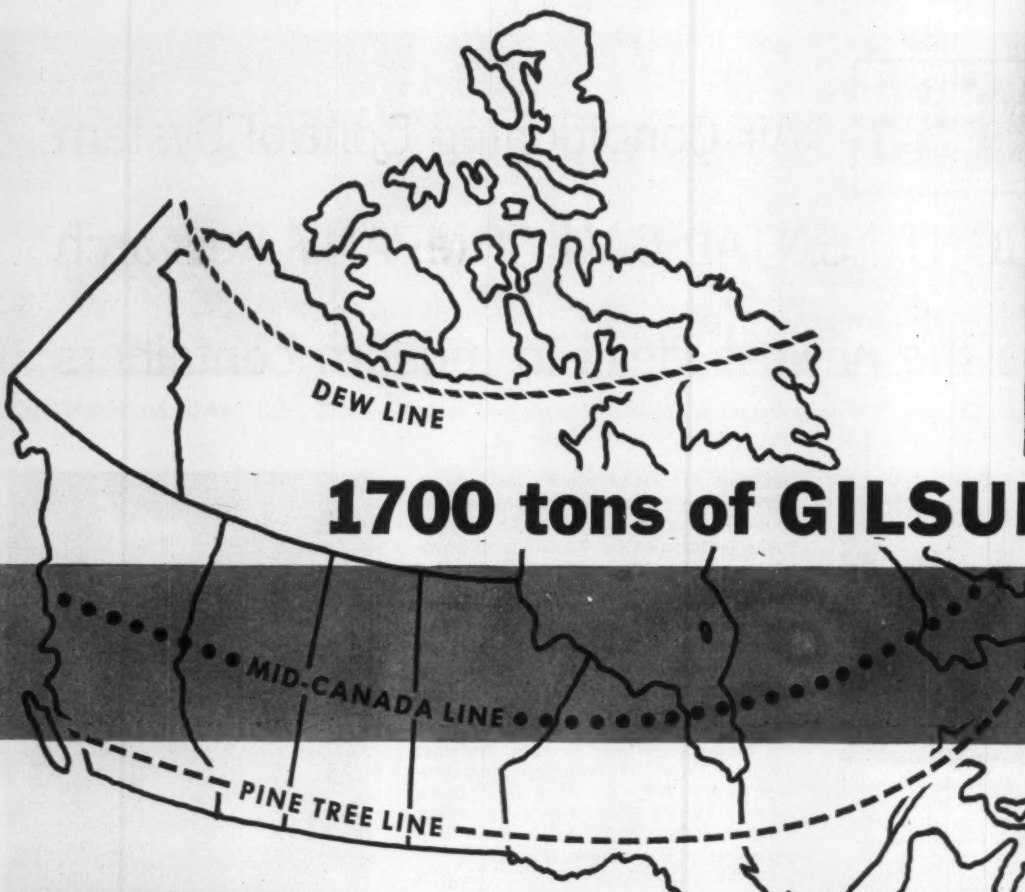
THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS | *Offices in chief cities in U.S.A. and Canada*

65 Years of Automatic Temperature and Humidity Control

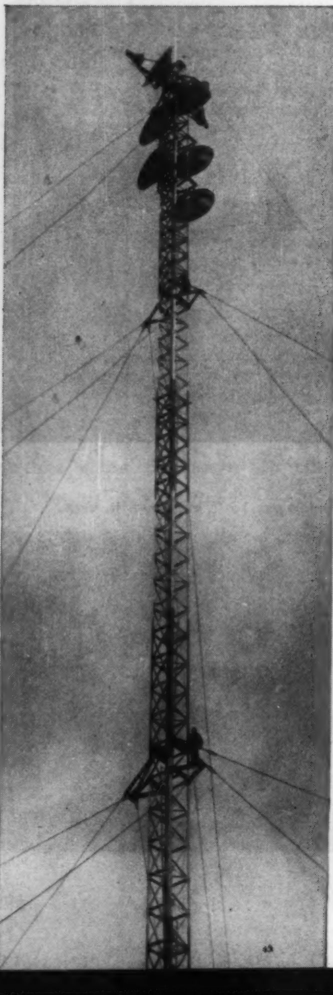
POWERS CONTROL

Vertical drawing boards shown below are 15 ft. long by 8 ft. high.


DEW LINE
MID-CANADA LINE
PINE TREE LINE

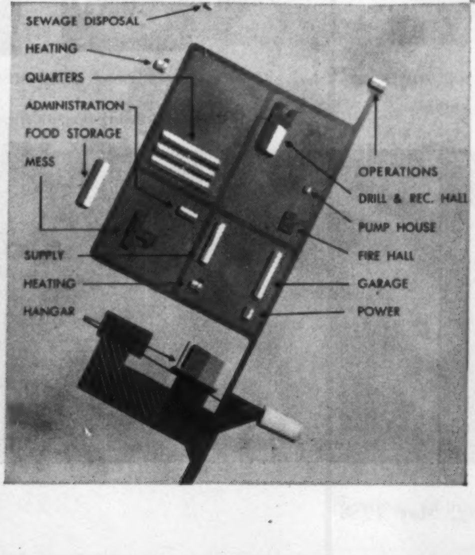
1700 tons of GILSULATE

RADAR NETWORK
stretches 2700 miles across Canada;
alerts against invading aircraft.



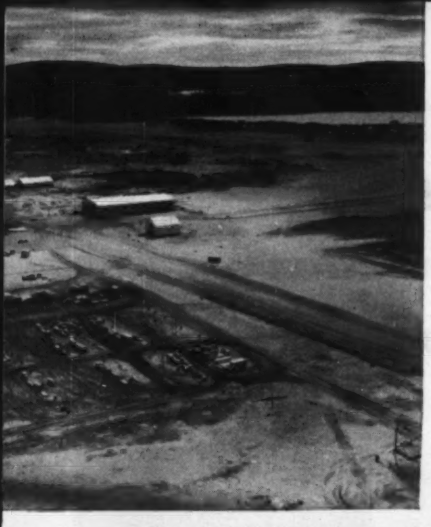
ALL TYPES OF TRANSPORTATION
were used in building the line.
Here, supplies are being loaded
into helicopter for final leg.
Ships, lighters, trains, trucks,
snow-tractor trains were used
to move 200,000 tons of material.

ROYAL CANADIAN AIR FOR
63


SEWAGE DISPOSAL
HEATING
QUARTERS
ADMINISTRATION
FOOD STORAGE
MESS
SUPPLY
HEATING
HANGAR
OPERATIONS
DRILL & REC. HALL
PUMP HOUSE
FIRE HALL
GARAGE
POWER

TYPICAL MAIN STATION LAYOUT
shows diversity of buildings
and services required.
Mid-Canada line confirms
more northern DEW line warnings,
alerts more southern Pine Tree
line at U. S. border.

Read the full story
of the Mid-Canada line
in PIPE INSULATION NEWS.
Ask to be put on our
mailing list!



MARSHALLING AREA
at Great Whale River,
important supply point
during construction.

guard Mid-Canada Radar Line

INSULATES STEAM AND UTILITY PIPES AT SUB-ARCTIC STATIONS

Standing guard along the 55th parallel of latitude is the Mid-Canada line, one of three vital warning systems for our continental defense. It complements the DEW line along the Arctic Circle, and the Pine Tree line just above the U. S.-Canadian border.

To keep these stations operating in all types of sub-arctic weather, steam and hot water are essential. A breakdown in these utility lines could hamper the operation of a station and endanger the lives of the men in it. Gilsulate was used by the Royal Canadian Air Force to protect the underground steam lines at several of these stations.

Each of the line's main stations delivers 12,000-15,000 pounds of steam per hour, using 4,000 feet of pipe. Gilsulate-protected pipes were not buried below five feet; no special trench preparation was made, but forms were used to conserve material. Inspectors from American Gilsonite Company supervised all installations.

Big job or small, near or far, you'll find that Gilsulate can provide the insulating efficiency and corrosion protection for underground hot pipes that you've been looking for. Ask your Gilsulate distributor for a demonstration of the unique properties of this poured-in-place insulation, or write to your nearest office for complete technical details.

FACTS ABOUT GILSULATE

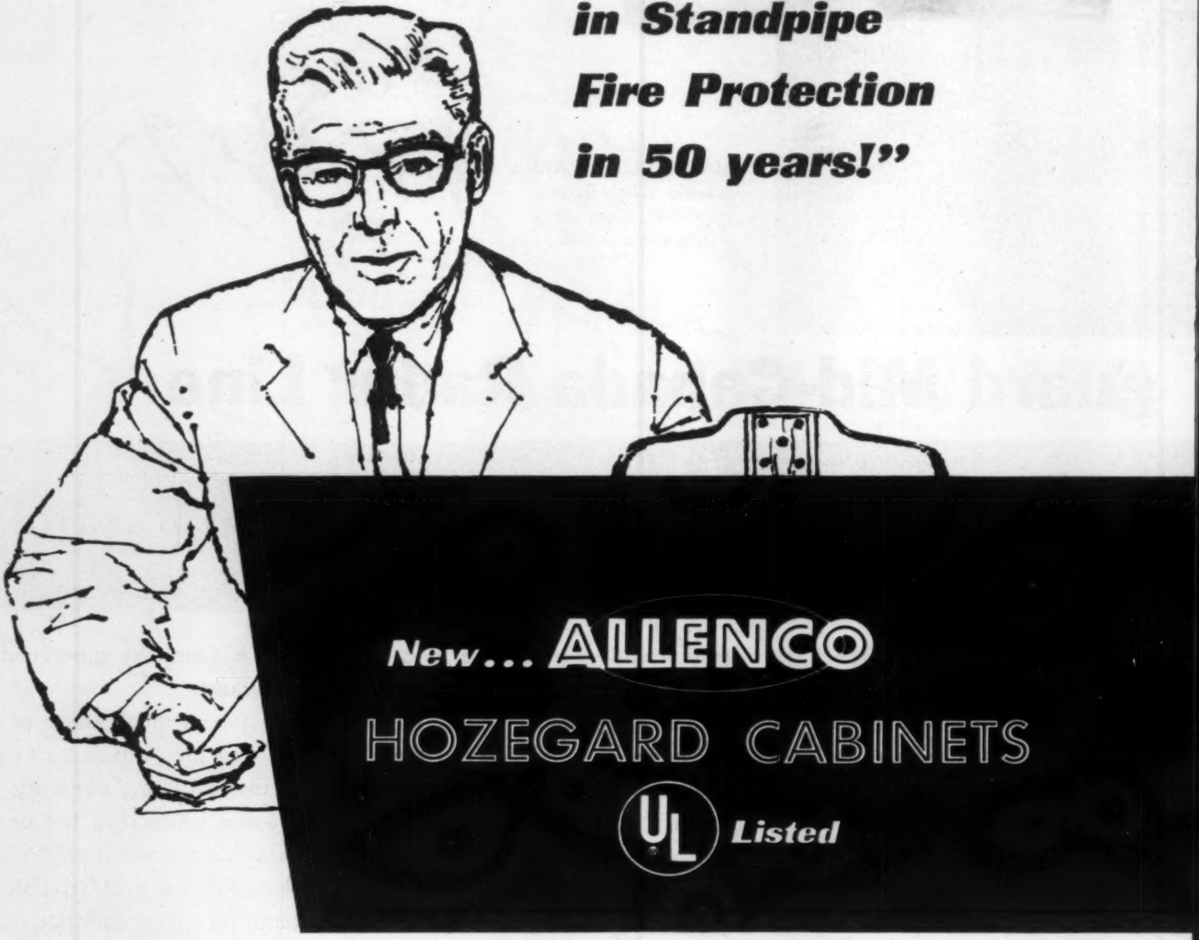
1. **Easy to use**—just pour and tamp... pipe heat does the rest.
2. **Forms 3 Zones** of protection against heat loss and all hazards commonly encountered by buried hot pipes.
3. **Needs no housing or mechanical sheaths:** no mixing, special handling or equipment.
4. **Only needs normal pipe spacing:** for multiple pipe or cramped conditions.
5. **Three types available:**
   Type A for 220°-300°F. temp. range
   Type B for 300°-385°F. temp. range
   Type C for 385°-520°F. temp. range

GILSULATE®

THE TRIPLE ZONE INSULATION SYSTEM FOR LIFETIME PROTECTION OF UNDERGROUND HOT PIPES

AMERICAN GILSONITE COMPANY, SALT LAKE CITY 1, UTAH
Affiliate of Barber Oil Corporation & Standard Oil Company of California
OFFICES AT: 134 West Broadway, Salt Lake City 1, Utah
The Agents Building, 3537 Lee Road, Cleveland 20, Ohio
Distributors in principal countries of the world

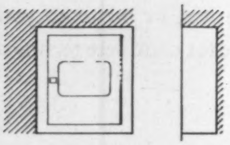
"Greatest improvement in Standpipe Fire Protection in 50 years!"



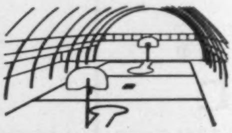
New... **ALLENCO**

HOZEGARD CABINETS

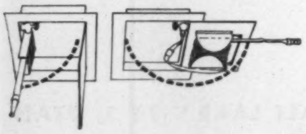
UL *Listed*



- **Save Space**—35% less area, less depth; not limited to walls, may be installed on any plane, even floors*



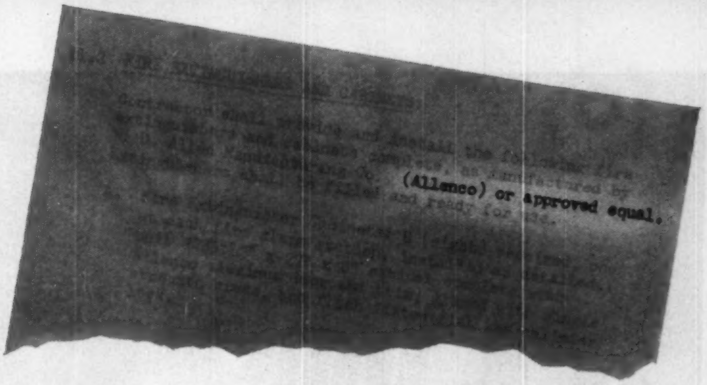
- **Cut Cost**—save 25%-30% on each unit installed, by eliminating costly pin-type rack and time of loading hose on it



- **Serve Best**—foulproof door-rack swings full 180 laterally *or* vertically; hose "points" faster, reaches further

UL Listed—thoroughly tested; *first* complete fire hose cabinet unit, including equipment, to be 100% Underwriters Listed

***using appropriate framing and solid (no glass) door**



(Allenco) or approved equal.

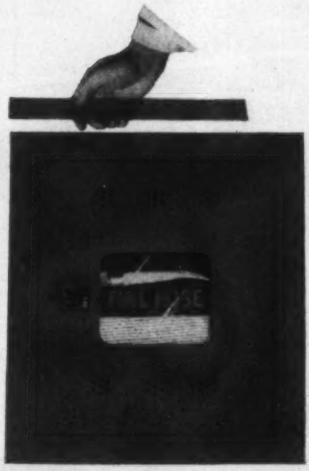


Fig. 7168
19"x22"x5½" I.D.
Holds 50 or 75-feet
of 1½" linen hose

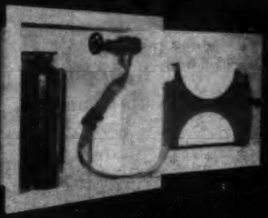


Fig. 7169
26"x27"x8" I.D.

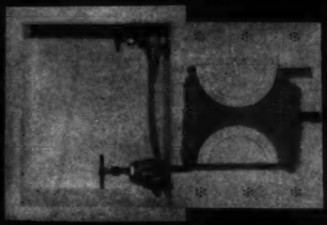


Fig. 7172
24"x30"x8½" I.D.

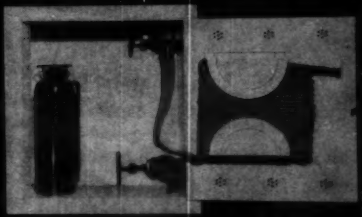
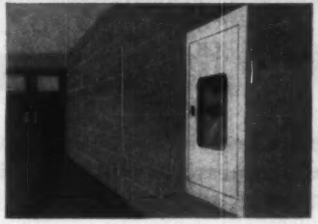


Fig. 7173
27"x30"x8½" I.D.

Each holds up to 100 feet of 1½" linen hose, 50 or 75 feet of Allen-flex hose, or 50 feet of Qua-flex hose, plus choice of extinguishers where shown and Fire Department valve where shown.

Tamper-proof Latch Shield (*optional*) keeps contents safe for emergency, yet breaks clean instantly



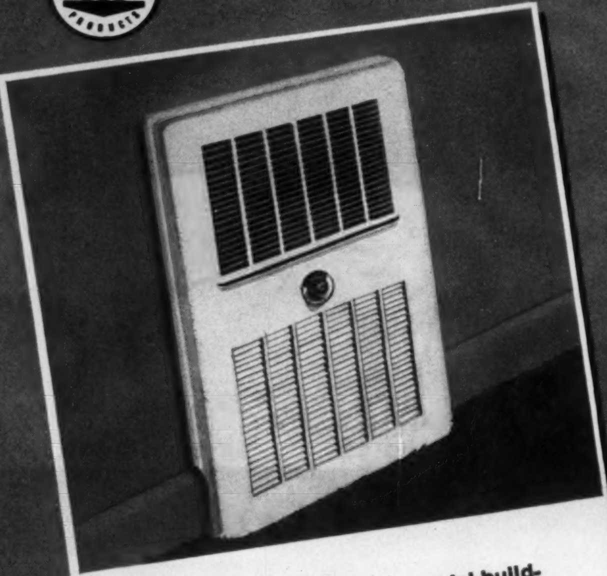
Blends Into Any Surface: choice of 3 trims, 2 door styles; finish on the job or by factory to your specs; face-flush vents

For SELF DEMONSTRATION or DATA phone your Allenco*nsultant* (listed in Yellow Pages) or write . . .

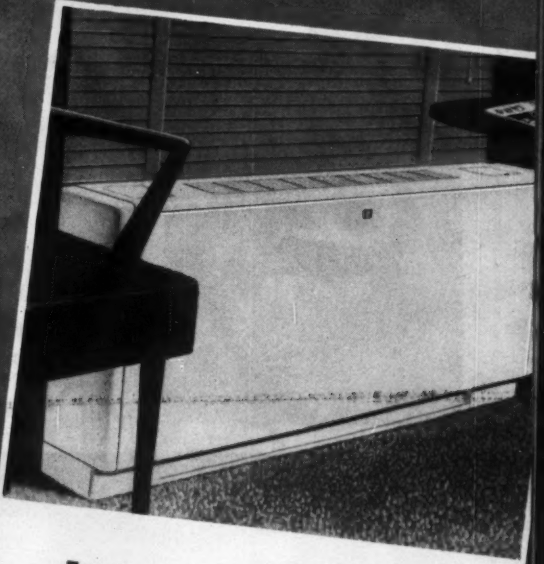
ALLENCO

W. D. ALLEN Manufacturing Co.
Room 500 Allenco Bldg. 566 W. Lake St. Chicago 6

Tell us where to send your copy of this handy digest reference (not a catalog) for specifying or installing non-sprinkler fire protection.



In homes and small commercial buildings, this compact Remotaire fits between wall studs, provides evenly distributed year 'round conditioning with water, with individual-unit control. Both 150 and 300 nominal cfm sizes for recessed or free-standing installation.



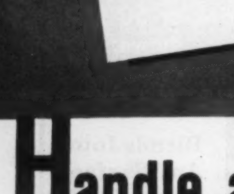
For large central applications, the 9-inch-thin vertical Remotaire saves usable floor space; permits fast free-standing or recessed installation. Remote boiler and chiller use the same piping. Exceptionally quiet in 200, 300, 400 and 600 nominal cfm sizes.

Handle all these year 'round air conditioning

There's a huge potential in year 'round air conditioning waiting to be tapped. Here's the American-Standard line of air conditioning units that lets you take profitable advantage of this market.

American-Standard offers a variety of systems for either central plant or self-contained heating and cooling. All units have strong steel cabinets and grilles that will withstand rough handling, have generous working space for easy connections.

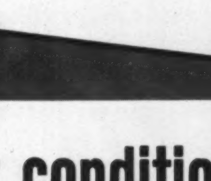
For complete satisfaction, do the job with an American-Standard boiler and chiller



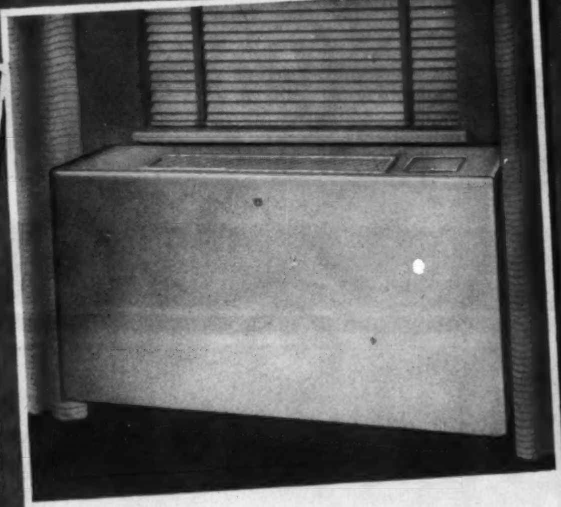
Small packaged boilers

New A-7 oil boiler

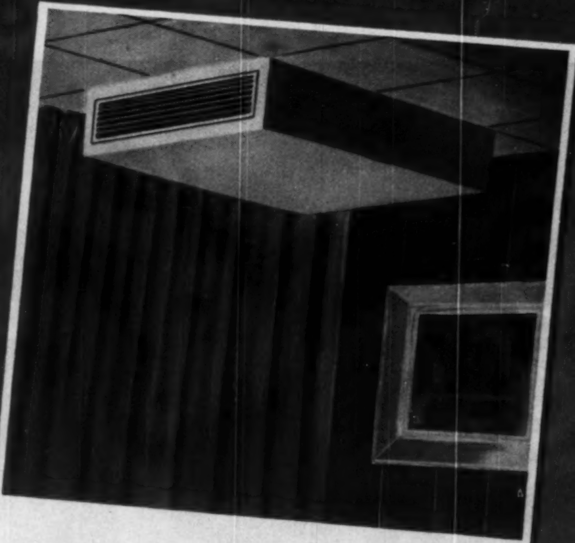
New G-6 gas boiler



Packaged chillers



In building modernization or new construction, the self-contained Remotaire is easily installed in the wall, has its own refrigeration circuit. Integral coil on one-piece chassis connects quickly to steam or hot water piping. Two chassis sizes available with wall or floor-mounted cabinets.



For overhead installation, where floor space is limited, the horizontal Remotaire may be attractively exposed at the ceiling or neatly concealed in closets, drop ceilings or furred-down spaces. Units are available in three cabinet styles and 200, 300, 400 and 600 nominal cfm sizes.

TEST-RATED by American-Standard

jobs with American-Standard test-rated systems

Building management is sold on the flexibility of these systems that can be engineered for any variety of conditions. Units are extremely quiet, well insulated, attractive. All room units are *test-rated* for air capacity, thermal capacity, quietness, limit of humidity.

Write for the profitable details to AMERICAN-STANDARD, PLUMBING AND HEATING DIVISION, 40 W. 40th Street, New York 18, N. Y.

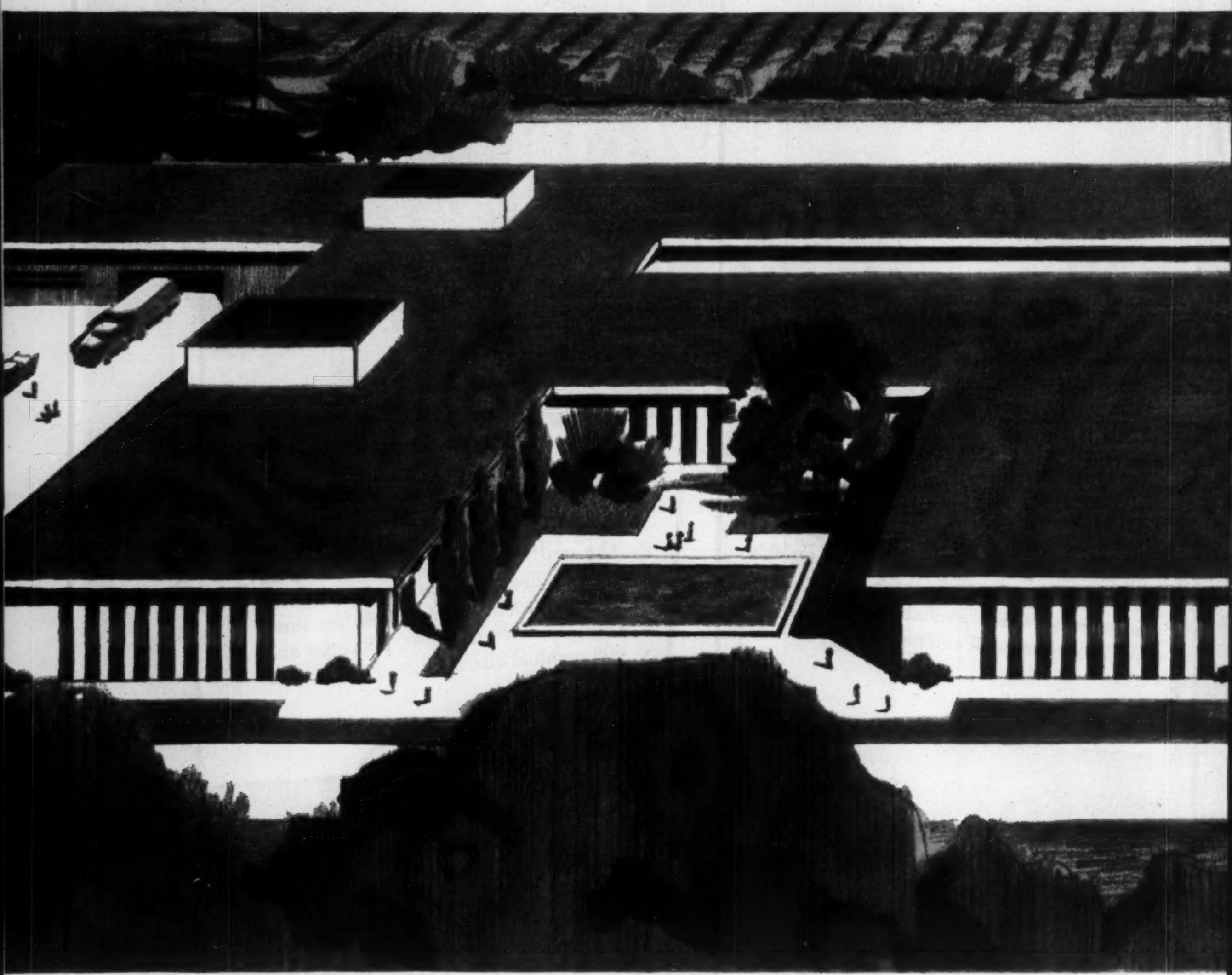
American-Standard & "Standard" are trademarks of American Radiator & Standard Sanitary Corporation.

AMERICAN-Standard PRODUCTS

AMERICAN-Standard

PLUMBING AND HEATING DIVISION

...NOW WE'RE



Specify Arkla-Servel Gas Air Conditioning and you specify years of trouble-free comfort

With the new Arkla-Servel Gas Absorptive Cooler, your clients will get extra—even exclusive—advantages that they'll get *only* with a gas cooling system.

Only gas gives these important advantages:

. . . High efficiency at *all* times—even during the light loads.

. . . Constant temperature control.

. . . Modular adjustment of capacity (instant automatic adjustment to match actual cooling requirements).

. . . Dependability of fuel service at all times.

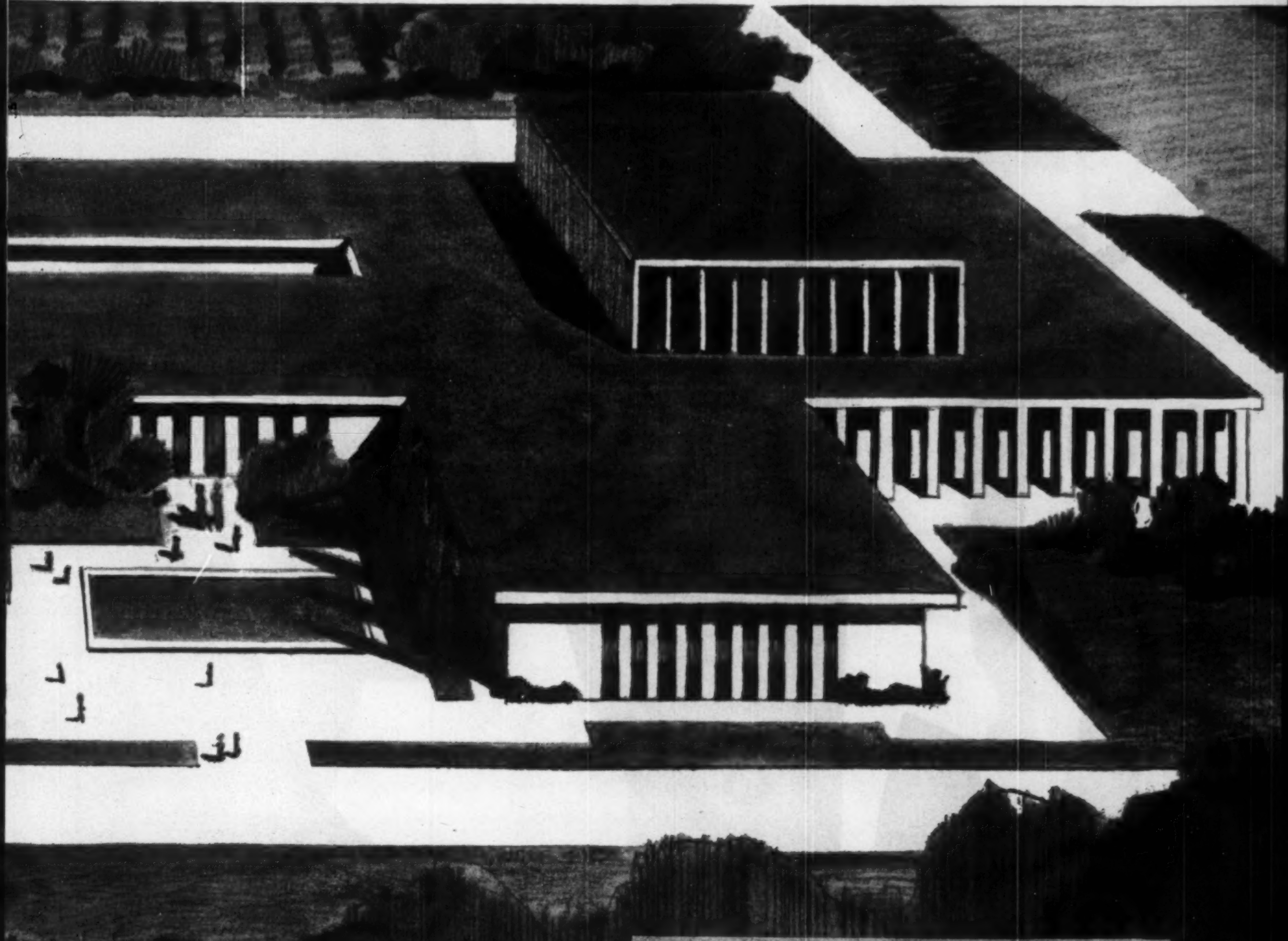
The 25-Ton Arkla-Servel Cooler

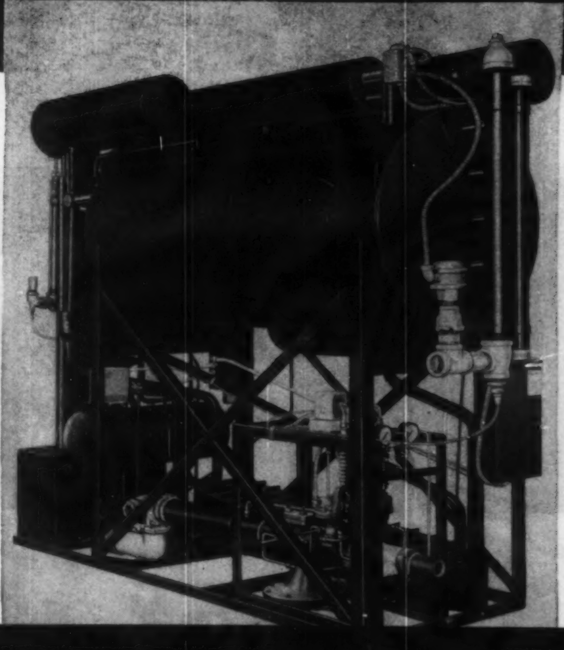
. . . A compact unit, easy to install and light enough for rooftop installation.

. . . Costs are low for installation, operation and maintenance. No specially trained operating or maintenance personnel are required.

. . . Can be installed singly or in banks to fit any size installation.

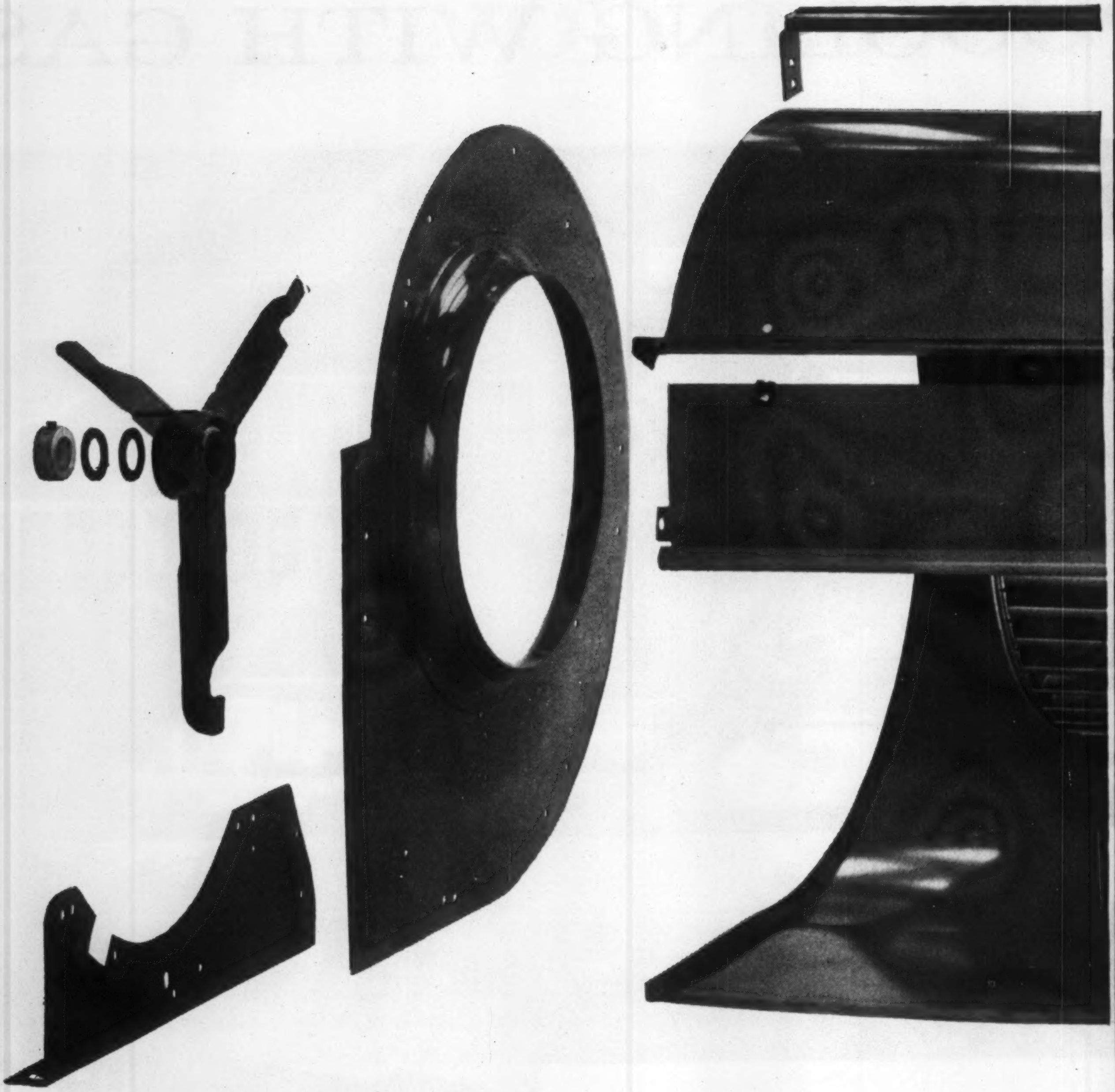
COOLING WITH GAS



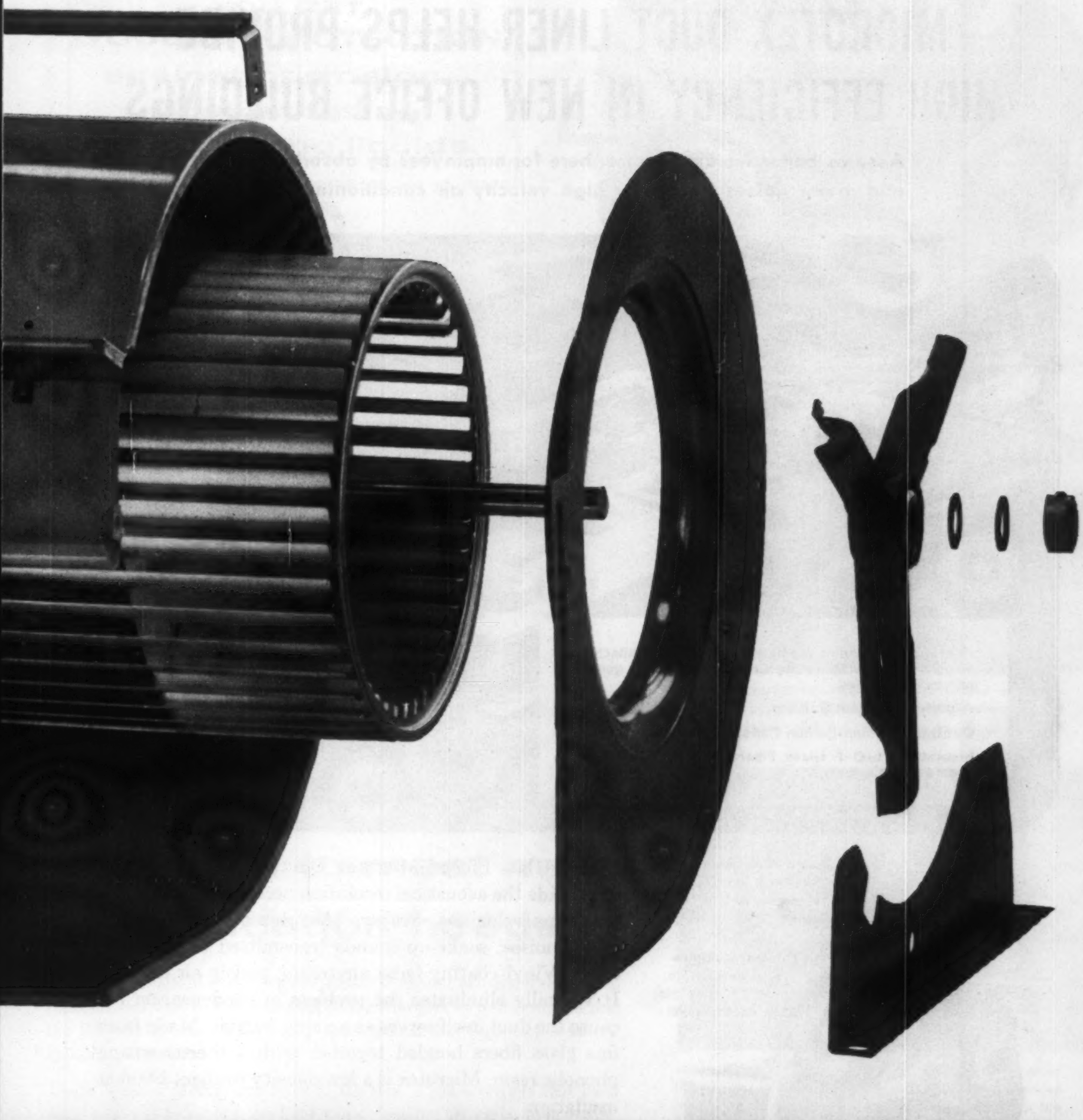


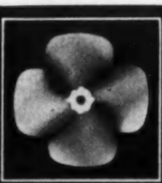
Gas absorptive cooling can put your commercial and industrial clients' heating plant on a year around paying basis. It utilizes low pressure steam to cool water, has no moving parts to wear out, and provides quiet, economical operation. What's more, it's *vibration-free*.

Take advantage of the consulting free services provided for you by your gas company. They have trained specialists who have been working with contractors and builders for years. They belong to your associations or affiliations and are familiar with your problems. Check the facts about gas and you'll see—modern gas air conditioning out-performs all other fuels. *American Gas Association.*



EXPLOSION!





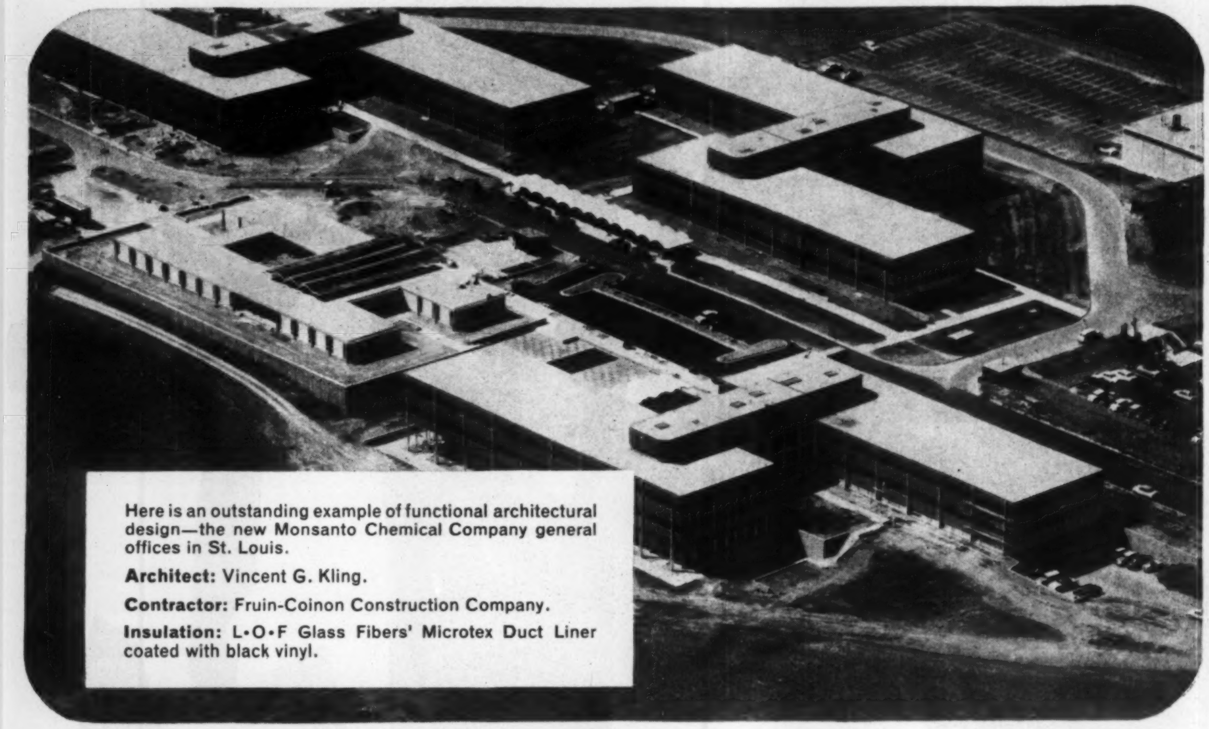
The new Torrington line of Vari-Basic blower units has quietly exploded all previous concepts of quality, flexibility, versatility and structural cleanliness. ▪ And the exploded view shown here tells the inside story of why: ▪ The famous Center Lock Airotor wheel design ...permanently lubricated bearings ... spot-welded heavy steel construction ... superb finish ... four-way variability to meet directional flow requirements ... interchangeability with existing standard equipment. ▪ And Torrington's flexible marketing policy makes these components available singly or in combination. For full information, *talk to Torrington!*

THE TORRINGTON MANUFACTURING COMPANY

TORRINGTON, CONNECTICUT · VAN NUYS, CALIFORNIA · OAKVILLE, ONTARIO

MICROTEX DUCT LINER HELPS PROVIDE HIGH EFFICIENCY IN NEW OFFICE BUILDINGS

Assures better working atmosphere for employees by absorbing fan and motor noises from new high velocity air conditioning system.

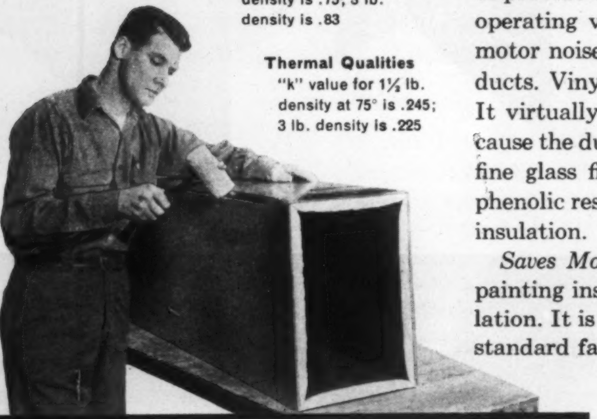


Here is an outstanding example of functional architectural design—the new Monsanto Chemical Company general offices in St. Louis.

Architect: Vincent G. Kling.

Contractor: Fruin-Coinon Construction Company.

Insulation: L•O•F Glass Fibers' Microtex Duct Liner coated with black vinyl.



Sound Absorption
NRC for 1" liner, 1½ lb. density is .75; 3 lb. density is .83

Thermal Qualities
"k" value for 1½ lb. density at 75° is .245; 3 lb. density is .225

L•O•F Glass Fibers' Microtex Duct Liner was selected to provide the acoustical insulation necessary under peak operating velocities. *Reason:* Microtex absorbs fan and motor noises; soaks-up sounds transmitted through the ducts. Vinyl coating faces airstream: resists air erosion. It virtually eliminates the problem of condensation because the duct itself serves as a vapor barrier. Made from fine glass fibers bonded together with a thermosetting phenolic resin, Microtex is a low density resilient blanket insulation.

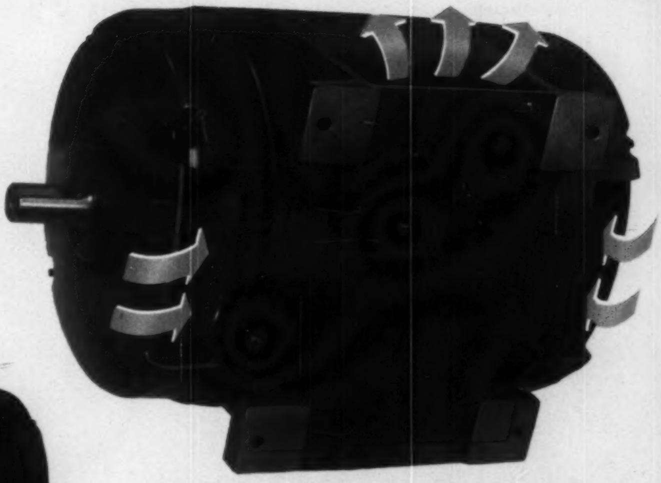
Saves Money, too. Ducts lined with Microtex need no painting inside, near grills or large registers, after installation. It is applied quickly without precision work using standard fabrication methods.

See how Microtex Duct Liner can help solve your insulation problems. Call or write the nearest L•O•F Glass Fibers' sales office or distributor.

LOF GLASS FIBERS

L•O•F GLASS FIBERS COMPANY • TOLEDO 1, OHIO

YOU GET DOUBLE PROTECTION against corrosion... against falling or splashing liquids



Air intakes and outlets are positioned to provide complete dripproof protection.

TYPE DP
1 to 125 hp

DOUBLY PROTECTED—Wagner DP Motors offer the *double protection* of completely dripproof enclosures and rugged cast iron frames that can take rough handling and resist corrosion.

with WAGNER TYPE DP MOTORS designed to meet more application needs

Wagner Type DP Motors offer the *double protection* of rugged corrosion-resistant cast iron frames and dripproof enclosures so well designed that the DP Motor can handle many applications that formerly required splashproof motors.

These Wagner Motors are built in the new NEMA ratings that pack more power in less space, are lighter in weight and are easier to maintain.

SLEEVE BEARING MODELS AVAILABLE

The entire line of ratings through 125 hp is available with ball bearing construction as illustrated, or with steel-backed, babbitt lined sleeve bearings that have high load carrying capacity and provide quieter operation.

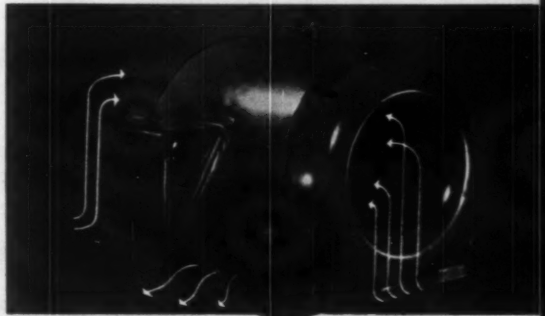
Let a Wagner Sales Engineer show you how these motors can be applied to your needs. Call the nearest branch office or write for Wagner Bulletin MU-223.

1 to 125 HP—1750 RPM—40°C
NEMA FRAMES 182 through 445U

Wagner Electric Corporation
6400 Plymouth Ave., St. Louis 14, Missouri.

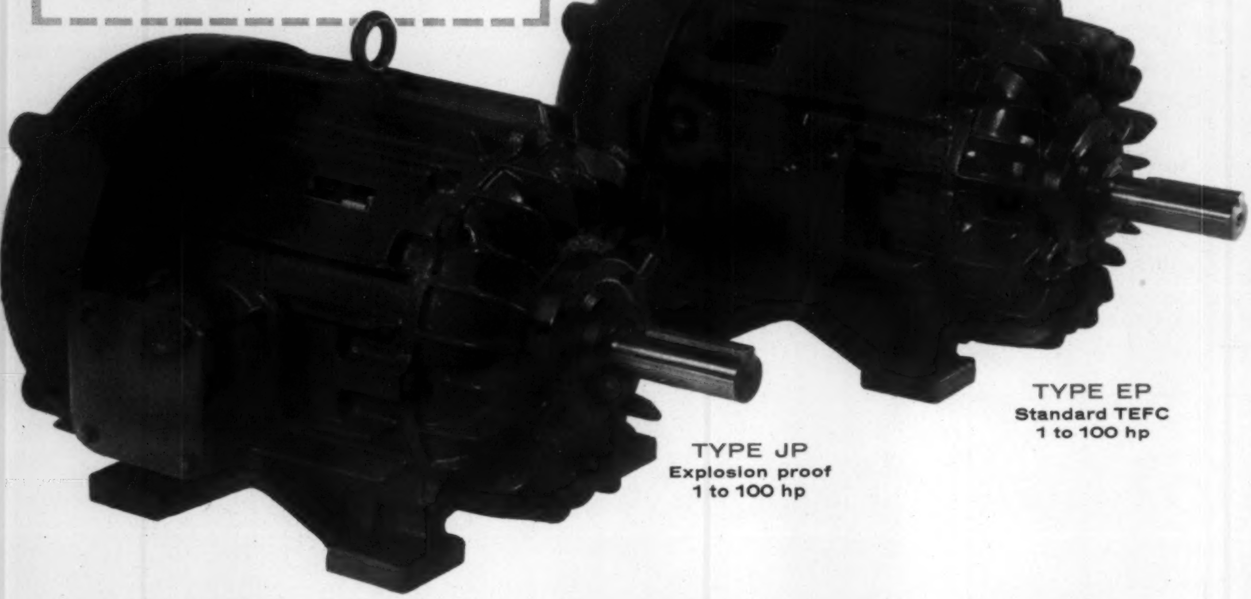
WM58-9

CAN BE RELUBRICATED—Factory lubrication will last for many years in normal service—but openings are provided to permit the relubrication that adds years to motor life under severe conditions.



COOL RUNNING—Specially designed baffles direct cooling air through the motor to reduce stator temperature—thus increasing motor life. Blowers, cast as part of the rotor, move large volumes of air without noise or vibration.

YOU GET
EXTRA PROTECTION
against corrosive...
abrasive or
explosive elements



TYPE EP
Standard TEFC
1 to 100 hp

TYPE JP
Explosion proof
1 to 100 hp

with Wagner totally enclosed motors... protected for longer motor life

If you need motors that will keep production rates up . . . that will give the continuity of service that is so important to automation . . . that will operate with complete dependability under the most severe conditions —Wagner totally-enclosed motors are your soundest choice.

Type EP Motors offer protection against corrosion, dust, abrasives, fumes, steel chips or filings. Type JP is explosion proof as well — designed and approved for use in explosive atmospheres.

NEW NEMA FRAMES—These motors are built in the new NEMA Frame sizes from 182 through 445U, with ribs that add mechanical strength and increase the surface cooling area. Effective cooling system adds to motor life.

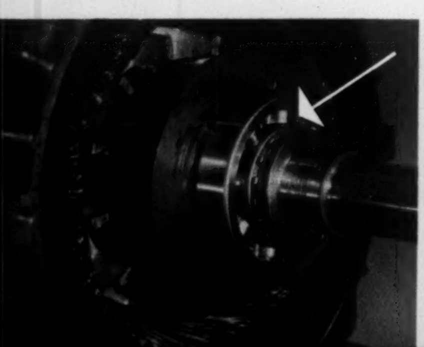
Let your Wagner Sales Engineer show you how these protected motors can bring you savings on initial motor costs, maintenance costs and continuity of operation.

1 TO 100 HORSEPOWER—4 POLE, 60 CYCLE—NEMA FRAMES 182 THROUGH 445U

Wagner Electric Corporation
6400 Plymouth Ave., St. Louis 14, Missouri. Branches and Distributors in All Principal Cities

HEAVY DUTY BALL BEARINGS

The ball bearings used in these motors are of the highest quality, with more than ample capacity to provide long troublefree service under heavy loads.

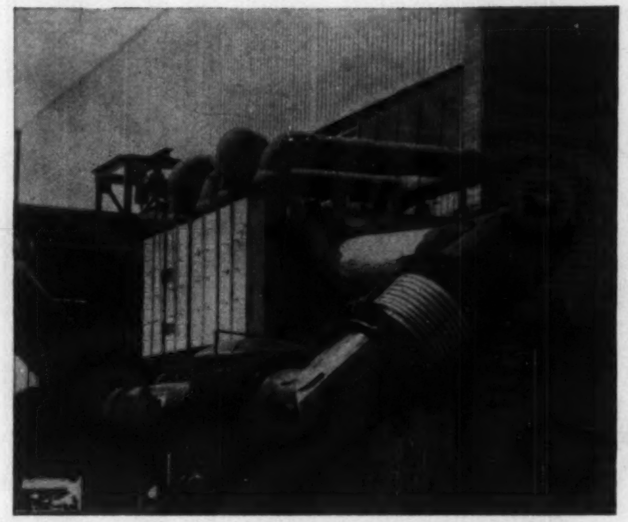


BEARINGS CAN BE RELUBRICATED

Factory lubrication will last for many years under normal service, but openings are provided to permit relubrication that adds years to motor life under severe conditions.

SEALS KEEP BEARINGS CLEAN

Both ends of these motors have running shaft seals to keep the bearings clean. Bearing housings are effectively sealed to prevent escape of grease.



SPECIAL EXPANSION JOINTS

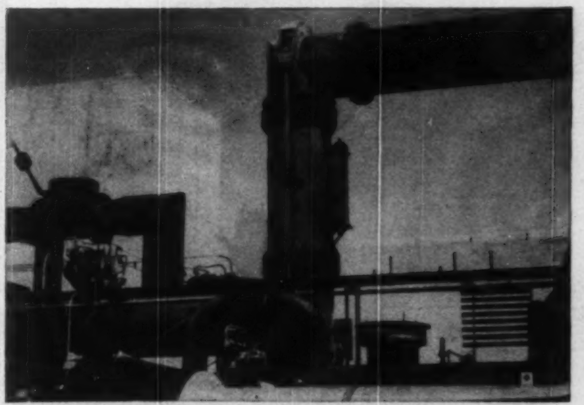
are Second Nature to

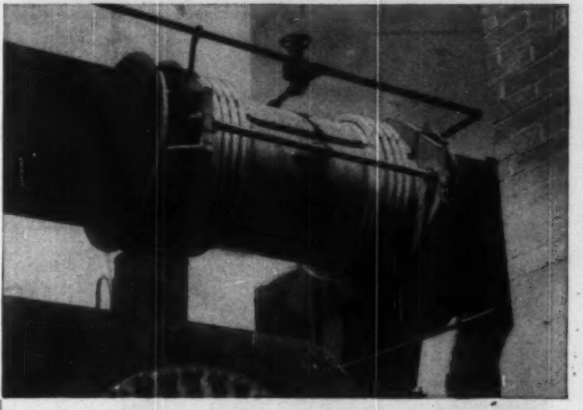
ADSCO

These photographs show installations of special ADSCO Corruflex Expansion Joints at the Fairchild Engine Division, Fairchild Engine & Airplane Corp., Deer Park, Long Island, N. Y. All joints are designed to absorb lateral motion only, except that the long universal joint, right center, also absorbs any axial growth of its own. All joints are equipped with internal sleeves to smooth out the flow of high-temperature air being carried by the piping systems. They are not standard joints; they are specially engineered, specially manufactured.

A few years ago, when ADSCO was pioneering packless joints for special work, a job like this took considerable engineering and manufacturing time... because it was a new field. But since then, ADSCO has acquired so much experience from so many special orders that special jobs like the Fairchild one are truly "second nature".

Special applications of packless joints are developed carefully but not laboriously. Experience enables ADSCO engineers to get the work out easily and with confidence. Consult them next time you have a special piping problem.





REMEMBER!

Use ADSCO Expansion Joints instead of Pipe Bends because of these advantages.

1. LESS HEAT LOSS
2. LESS PRESSURE DROP
3. LESS SPACE
4. LESS COST

ADSCO DIVISION

20 MILBURN STREET
BUFFALO 12, NEW YORK

YUBA

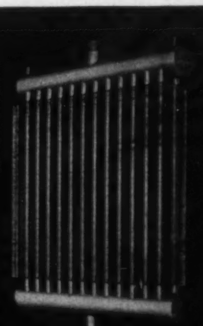
YUBA CONSOLIDATED INDUSTRIES, INC.

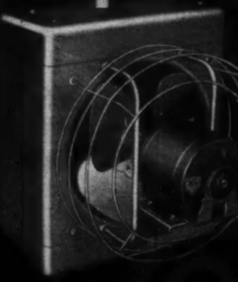
NEW IMPROVED

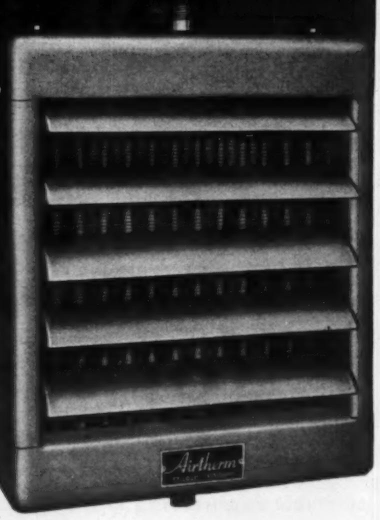
Airtherm

PROPELLER FAN
UNIT HEATERS
FOR STEAM OR HOT WATER

A SIZE FOR EVERY REQUIREMENT







The new Airtherm line incorporates 22 completely redesigned vertical units and 24 improved horizontal units, ranging from 18,000 to 555,000 BTU per hour, with a choice of outlet diffusers to cover practically every air distribution pattern and mounting height. Silent operation is assured by resiliently mounted motors, properly designed fans and casings, and attention to face and outlet velocities. All fans are expertly positioned, balanced and tested. Each unit is tested and rated for performance in strict accordance with the Standard Test Code of the industry. Only brand name, continuous duty motors, especially made for the purpose, are used and mountings are designed for efficient cooling and easy servicing. Rugged coils are formed by hydraulically expanding copper tubing into plate type aluminum fins, each with its own collar, providing increased heat transfer and wide, even spacing to reduce clogging. All coils are tested and tagged for 500 p.s.i. hydrostatic pressure. Casings are phosphatized to insure a long, rust-free life for the attractive baked enamel hammer tone finish.

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702 S. SPRING AVE. • ST. LOUIS 10, MO.

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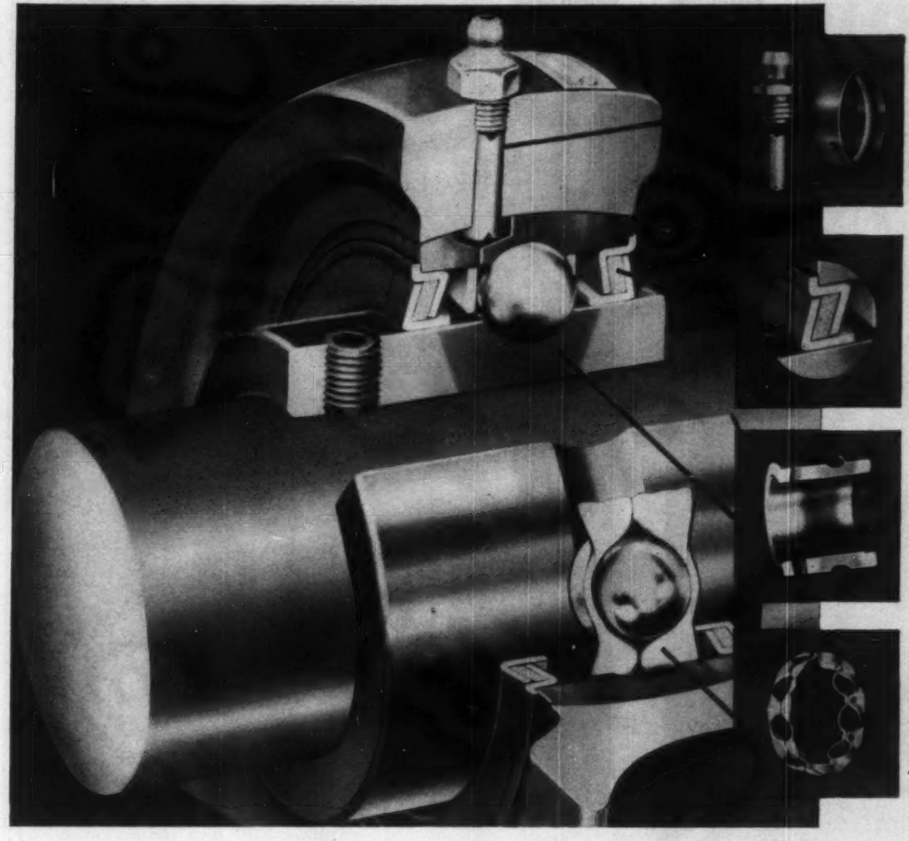

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LOCKING PIN & PERIMETER DIMPLE

. . . permits selective fit between outer race of bearing and housing — an important feature that assures quiet bearing operation for air conditioning service.

LABYRINTH SEAL

. . . keeps dust and dirt out and lubricant sealed in, assuring long bearing life.

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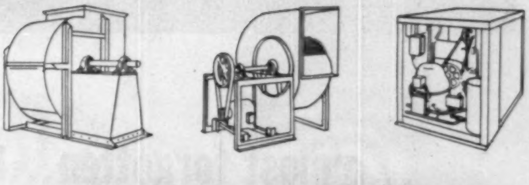
. . . assures positive race to shaft holding power. Reduces corrosion.

LAND RIDDEN BALL RETAINER

. . . minimizes ball wear, traps grease and prevents "churning."

An air conditioner — like any piece of equipment — becomes obsolete the day your competitor's product out-performs your own. It is for this reason that air conditioning engineers are continually involved in research to find ways to improve their product. It's the reason, too, that you find SEALMASTER Ball Bearing Units specified by many of the leading air conditioning manufacturers. SEALMASTER Ball Bearing Units, with their exclusive combination of patented engineering features, provide you with a decided performance advantage. It's the ball bearing unit line that's often copied but never equalled for performance.



SEALMASTER®

BALL BEARING UNITS

PILLOW BLOCKS

CARTRIDGE UNITS

FLANGE CARTRIDGE UNITS

RUBBER MOUNTED UNITS

FLANGE UNITS

Write for catalog 454

SEALMASTER BEARINGS A DIVISION OF STEPHENS-ADAMSON MFG. CO. 47 RIDGEWAY AVENUE, AURORA, ILL.

...almost forgotten...because it does its job so well!

Dependable, year-after-year performance makes a Fisher Diaphragm Motor Valve the preferred control in the power and process industries. The Fisher D.M.V. has features not available on other brands. The extra thick steel casing, the precision finished valve stem, the large capacity and the trouble-free operation —these are just a few of the reasons a Fisher gets the nod when it comes to diaphragm motor valve selection.

If you want to know more about the ultimate in control—the Fisher Diaphragm Motor Valve —write for Bulletin E657A.

IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD... CHANCES ARE IT'S CONTROLLED BY

FISHER GOVERNOR COMPANY

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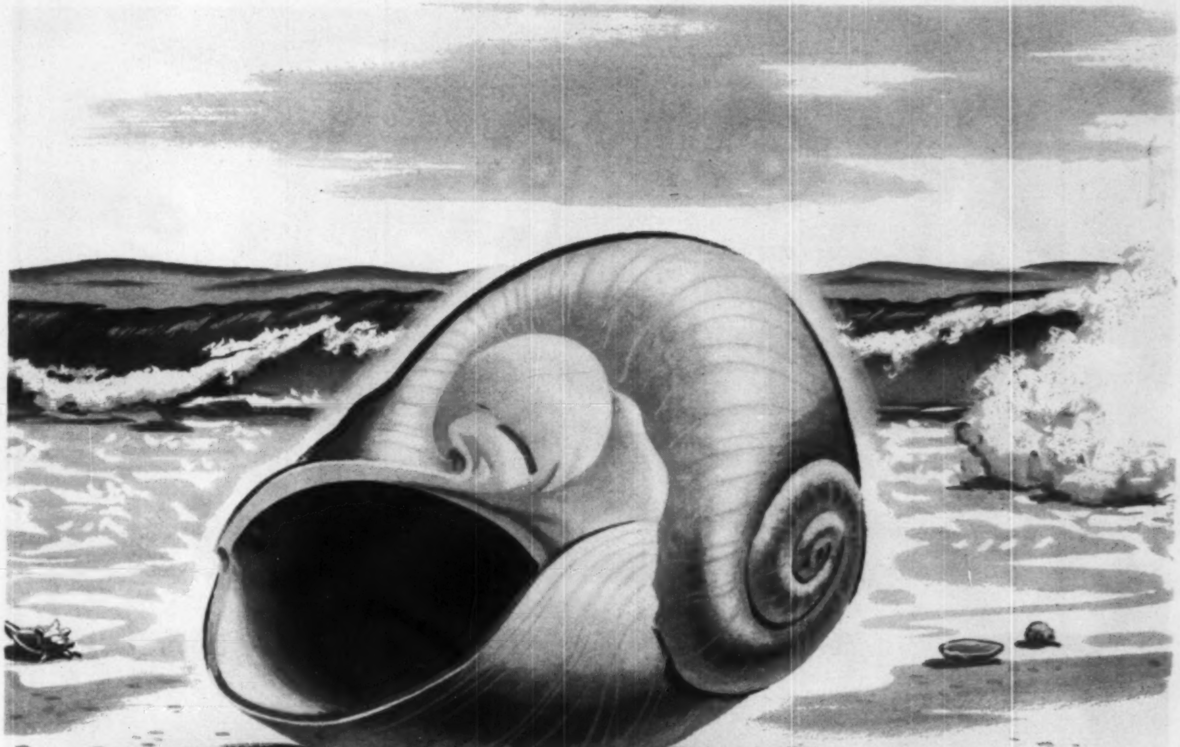
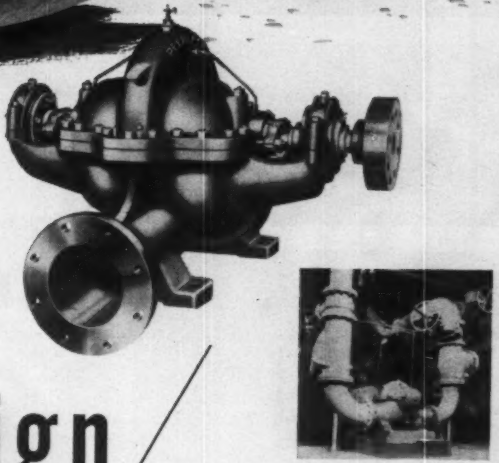
FISHER® Controls

SINCE 1880





"Field tested" for thousands, perhaps millions, of years, the simplicity of design of this sea shell has proved its practicability as dependable housing. In its field, the design of the Peerless Type A horizontal split-case pump is quite as remarkable. The split at the center line allows easy maintenance without disturbing the piping. The rotating element lifts out as a unit for inspection or repair. Mechanically and hydraulically, the quality and operation of this pump is unsurpassed — *it is the type of pump you can apply with absolute confidence to general purpose pumping duties in the broadest sense.* An added advantage: the Type A pump line is the broadest offered by any manufacturer.

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design/application

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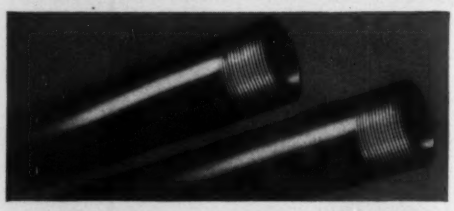
Offices: New York; Cleveland; Chicago; St. Louis; San Francisco; Atlanta; Plainview; Lubbock; Phoenix; Albuquerque; Los Angeles; Fresno. **Distributors in Principal Cities.** Consult your telephone directory.

Casablanca



These air-conditioned Florida hotels use hundreds of feet of

Beth-Co-Weld Pipe

Each of these two hotels — the Casablanca at Miami Beach and the Columbus, at Miami — has hundreds of feet of Beth-Co-Weld steel pipe in its modern air-conditioning system. Both installations were made by Hill-York Sales Corporation, Miami. The pipe was supplied by A & B Pipe & Supply Company, also of Miami.

Beth-Co-Weld pipe is a popular choice for air-conditioning systems, as well as for general-purpose and sprinkler piping, because it is made from a good grade of steel by the continuous-weld process.

Beth-Co-Weld can be obtained in standard and extra-strong weights in sizes from ½ in. to 4 in. It comes in 21-ft lengths, plus or minus 1 in., and is also supplied in random and cut lengths. Specify Beth-Co-Weld for your next piping job.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

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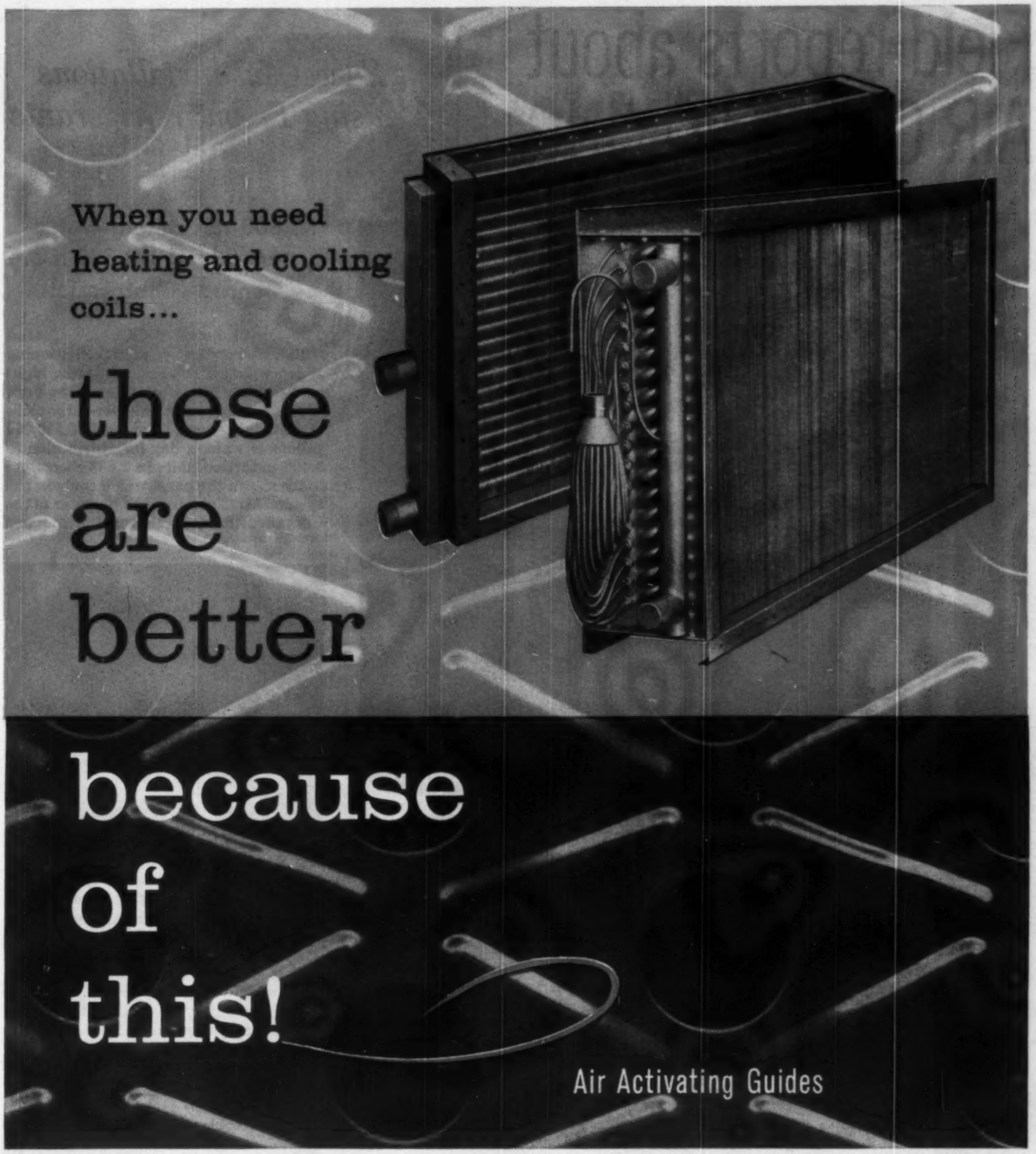
When you need heating and cooling coils...
these are better
because of this!
Air Activating Guides

This Westinghouse fin design activates air ... does away with dead-air film

All Westinghouse continuous Plate-Fin Coils feature:

- *Permanent Mechanical Bond—Fin to Tube*
- *Minimum Air Resistance*
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And for heavy-duty industrial process and high-pressure steam heating . . . standard sections with extra-heavy wrought-iron finned pipe are available.

Call your Sturtevant Division Sales Engineer for complete details on your heating and cooling coil requirements, or write Westinghouse Electric Corporation, Department E-2, Hyde Park, Boston 36, Massachusetts.

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YOU CAN BE SURE...IF IT'S
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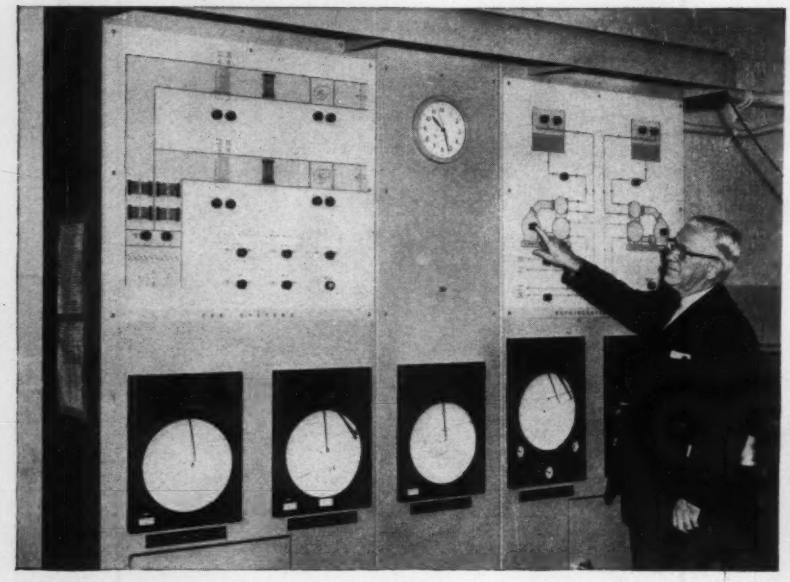
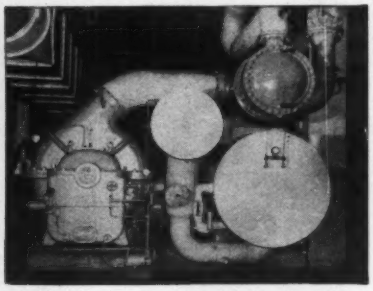
Field reports about AIR CONDITIONING

Successful installations using Freon refrigerants*



1,600-ton chilled-water system added to 2,760-room Conrad Hilton Hotel

The top 21 floors of Chicago's Conrad Hilton Hotel recently had air conditioning added with a 1,600-ton, four-zone, high-pressure induction-unit system. Two York 840-ton compressor-condenser-turbo chiller units (one shown below) chill 5,500,000 gallons of water a day for distribution to 3,400 induction units in 2,633 rooms. At left is shown the panel which controls the system. Mr. Toombs, chief engineer of the Conrad Hilton, is shown starting one of the compressors. Left half of the panel controls fans which send filtered, washed air to each room. System is divided into four zones, each consisting of rooms with similar exposure conditions. In winter, induction units handle water heated by the building's existing steam system.



The refrigerating system is charged with "Freon-11" refrigerant, chosen because of its proven safety, over-all economy and trouble-free performance. No maintenance problems have developed, and no "Freon" has been added to the system since it began operation.

No room revenue lost as prefabrication and careful planning expedite Conrad Hilton installation

When the York 1,600-ton air conditioning system was added to Chicago's Conrad Hilton Hotel (shown lower right), 2,400 feet of reinforced concrete were pierced and 3,400 induction units with piping and ductwork were installed in 2,633 rooms. It was done with no loss of room revenue and minimum disturbance to guests.

Each phase of construction was carefully meshed with hotel activities. Checkout time was moved to 8:00 A.M. At 8:30 contractors moved in, scheduled work was done in a room and it was ready for occupancy by 5:30 P.M. Ductwork and piping components were prefabricated in an adjoining building in room-by-room sections. According to plan, each room installation was made in a few hours after drilling and location of electrical feeders, service outlets and telephone lines had been completed. The whole job was finished three weeks ahead of schedule.

How Du Pont leadership in refrigerants means better performance for installations you plan

Today's more compact, more efficient equipment has grown in part from Du Pont's pioneering in development and manufacture of improved "Freon" refrigerants. Improved manufacturing techniques developed by Du Pont make "Freon" the refrigerant that sets the industry's standard for purity and performance. That's why you can be sure the air conditioning and refrigerating installations you plan will deliver better performance when charged with "Freon". You can't select a better refrigerant than safe, acid-free, dry "Freon" refrigerant.

For data on applications, performance or properties of "Freon", write: *E. I. du Pont de Nemours & Co. (Inc.), "Freon" Products Division 135, Wilmington 98, Del.*

FREON® REFRIGERANTS

**Freon and combinations of Freon- or F- followed by numerals are Du Pont's registered trademarks for its fluorinated hydrocarbon refrigerants.*

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Both you and your customers benefit from highest quality-control standards when you order and install Republic ELECTRUNITE® Stainless Steel Tubing and Pipe.

Produced by Republic—world's leading producer of alloy and stainless steels—in Republic mills to Republic's rigid specifications, ELECTRUNITE is welded by an exclusive process that units the wall under pressure without additional foreign or extra metal. Tests prove the ELECTRUNITE weld is as strong as, or stronger than, the original base metal.

"All ELECTRUNITE Stainless Steel Pressure Tubing and Pipe is fully solution annealed for maximum corrosion resistance."

ELECTRUNITE is easy to install—can be welded, threaded, or used with compression fittings. And ELECTRUNITE assures uniformity of wall thickness, strength, ductility, concentricity, diameter, and other physical and mechanical properties for dependable, predictable workability.

Pipe sizes are available from ⅛" through 2" I.P.S. in A.S.A. schedule 40S; from ⅛" through 4" I.P.S. in A.S.A. schedule 10S; and from ½" through 4" I.P.S. in schedule 5S wall thicknesses. Tubing is available in sizes from ¼" O.D. to 5" O.D. with wall thicknesses of .020" to .165" (depending on the O.D. size of tube). Larger tube and pipe sizes up to 40" O.D. are also available. Each full length is continuously stenciled with type, heat number, and specification for easy identification no matter where it's cut. ELECTRUNITE Stainless Steel Tubing can also be furnished with I.D. polished, O.D. polished, or both, to meet any sanitary requirement.

For the *right* stainless steel tubing or pipe to meet your specific requirements call your Republic ELECTRUNITE Distributor. You'll enjoy doing business with him—over and over again.

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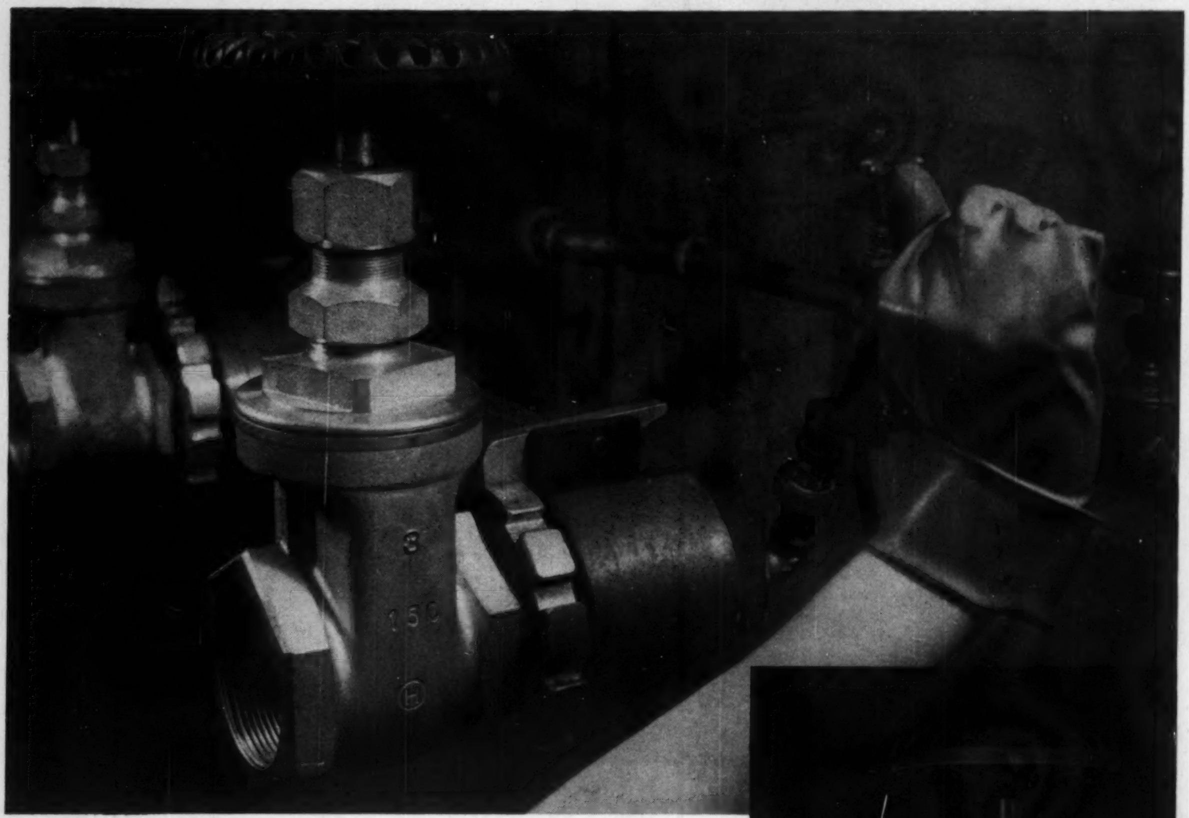
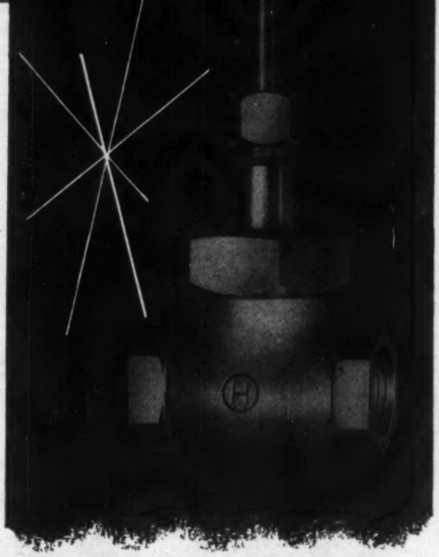


Each valve individually tested



Hammond Number 413 globe valve is rated for steam service up to 150 lbs., 300 lbs. W.O.G. Has slip-on composition disc, union bonnet, stuffing box, gland follower. Complies with Federal spec WW-V-51A, Type 1, Class B.

Before it leaves the factory, each Hammond Bronze Valve is individually pressure-tested for perfect closure. For example the Number 619 gate valve above is rated for 150 lbs. Before passing final inspection it must prove drop-tight under an individual hydrostatic test at 300 lbs., as shown. This individual testing is typical of the many rigorous checks and inspections that verify Hammond quality—quality second to none in the valve industry.

Hammond manufactures bronze valves exclusively—and rigorously controls every step from the melting of the virgin ingot to final individual testing. High volume production, in a modern, "automation" factory, permits economies which are reflected in moderate prices for valves of outstanding quality.

Write today for your copy of our new catalog No. 158 describing Hammond's complete line. Address Hammond Brass Works, Hammond, Indiana.

HAMMOND *BRITE-KOTE*® BRONZE VALVES

How do YOU lay out the heating and ventilating for today's new schools?

Who, ME?

Every schoolhouse architect and consulting engineer has probably heard about the sizable reductions in school building costs that have been effected by the introduction of the Nesbitt Series Wind-o-line System of heating, ventilating and natural cooling.

Not all are completely familiar with the layout and application of this unique system—which offers the highest standard of classroom thermal comfort of all such systems *plus* savings of 20% or more of the construction, equipment and installation costs entailed by the conventional system with pipe trenches and runouts.

Nesbitt is most anxious for you and any of your staff to be acquainted with the new and different, but not difficult procedures employed in the layout of the Nesbitt Series Wind-o-line System. We not only offer catalogs and engineering data, but we invite correspondence, and will even arrange conferences in your office, if desired. Thus, your clients can come to know the satisfaction and economy—and you, the good will and prestige—that result from the installation of Nesbitt Series Wind-o-line.

Write us your questions, ask for Publications 104 and 114, or tell us when a Nesbitt representative may see you.

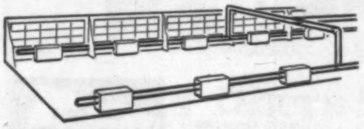
Nesbitt

SERIES WIND-O-LINE SYSTEM

MADE AND SOLD BY JOHN J. NESBITT, INC., PHILADELPHIA 36, PA.
Sold also by American Blower Corporation and American-Standard Products (Canada) Ltd.

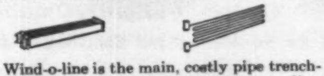
WHAT IS THE NESBITT SERIES WIND-O-LINE SYSTEM AND HOW DOES IT SAVE MONEY?

The system includes a Nesbitt Syncretizer unit ventilator in every classroom, with Wind-o-line finned radiation installed along the sill.



The Wind-o-line copper tubing takes the place of the usual supply and return mains. Two-pipe direct or reversed return circuits are used, with a group of classrooms or even an entire wing of the building in a single circuit. Each classroom is individually controlled.

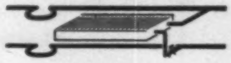
The Syncretizer multipass heating element extracts the required heat from a smaller quantity of water. System water temperature is automatically varied with outside temperature.



Since Wind-o-line is the main, costly pipe trenches, individual runouts and pipe covering are eliminated. Remaining mains are smaller and shorter.

Since only one-half to one-third the usual amount of hot water is circulated, smaller, less costly pipes and pumps are used.

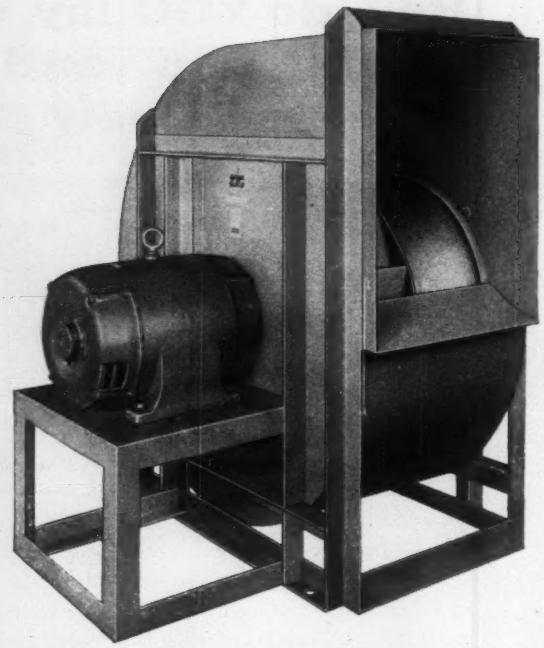
Packaged piping within the Syncretizer—crossover tubing, expansion loops, balancing valves, etc.—saves expensive jobsite fitting.



Wind-o-line protects against window downdraft and cold surfaces for as long as necessary, thus completing the protected learning environment.

Wind-o-line gravity heat gives overnight temperature protection without other special controls.

Total savings enable even low-budget schools to have the last word in heating and ventilating.



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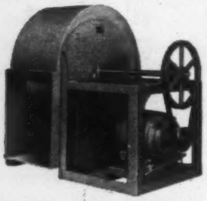
Specify *Peerless Electric*® Non-Overloading Direct Drive Blowers

Tested and rated to AMCA specifications. All-welded wheels statically and dynamically balanced. Motor base, frame and housing completely welded together for added strength on larger sizes. 12½" to 36½" wheel diameters. 1,110 to 24,560 c.f.m.

No obstruction at inlet. Air enters blower wheel through smooth, spun venturi, passes quietly through wheel and discharges over airfoil cutoff. Peerless-built, self-limiting horsepower motor prevents overloading at any condition.

Write for catalog No. 215 today

Peerless Electric® NON-OVERLOADING BELT DRIVE UTILITY BLOWERS



Designed for efficient, continuous, quiet duty in air conditioning systems in schools, labs, public buildings, industrial and commercial installations.

Simplicity of construction and sound engineering assure years of highly efficient, low noise level operation. 12½" to 36½" wheel diameters . . . 686 to 26,044 c.f.m.

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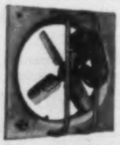
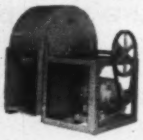
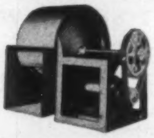
A COMPLETE LINE OF AIR MOVING EQUIPMENT



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.the only duct liner made exclusively of strong textile-type glass fibers...

"It will not pull apart under high vibration and high wind velocity conditions," says the Consulting Engineer who recently specified 15,000 ft. of Ultralite Duct Liner for one of America's outstanding new office buildings. "One of the major advantages of Ultralite liner over other forms is the long, fibrous structure which gives the material greater strength for retaining its structural shape."

Ultralite is the *only* glass fiber insulation made exclusively of long, strong, textile-type fibers. It's more rugged, more resilient—important advantages in duct systems continually subject to vibration and velocity. And easy-handling Ultralite offers exceptional acoustical and thermal efficiency, plus lower friction loss.

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Thermal and acoustical glass fiber insulations • Pipe couplings and fittings • Molded glass fiber pipe insulation

GIANT Turbine Expansion Joints Built by BADGER

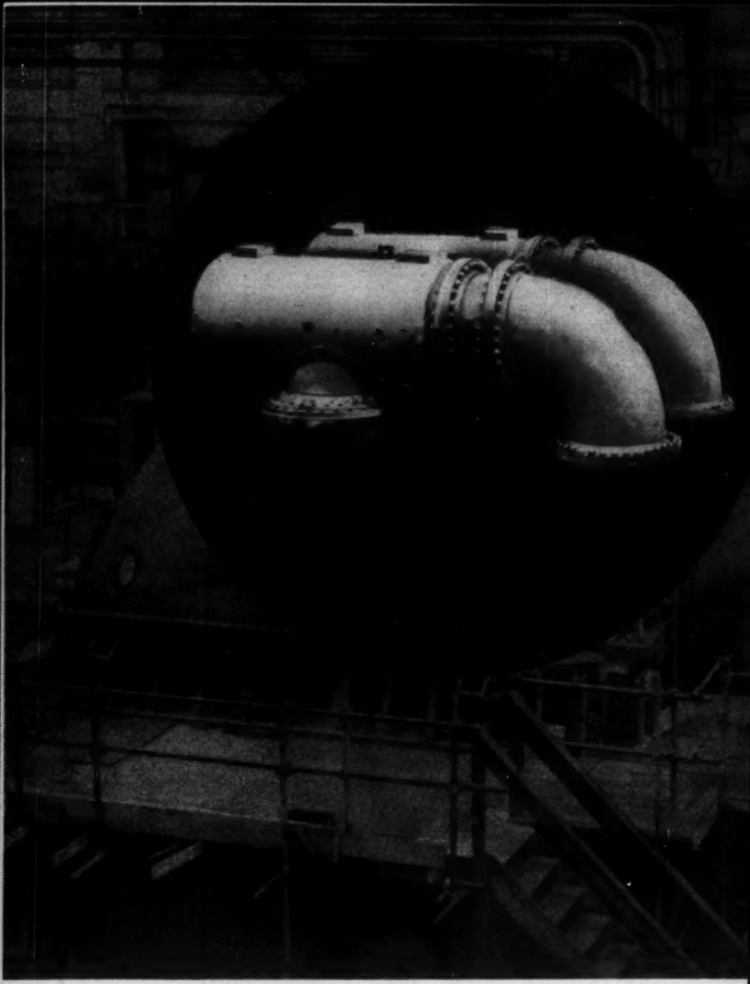
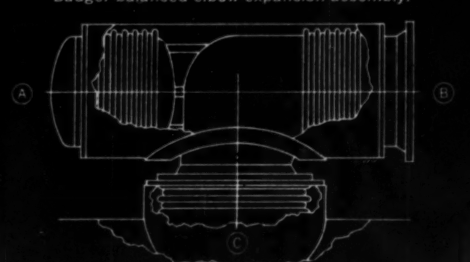


Photo shows 150,000 kw steam turbine-generator unit undergoing tests prior to shipment at General Electric's Turbine-Generator Plant in Schenectady, N. Y. Badger Expansion Assembly is clearly visible atop turbine.

Badger balanced elbow expansion assembly.



Joint A balances thrust due to internal pressure of 65-150 psi; joint B absorbs axial movement; joint C absorbs the differential expansion between the inner and outer casings of the turbine. Assemblies range in size from 36 to 42 inches in diameter.

Custom engineered assemblies include many features of Badger S-R Design

750°F steam is flashed through these turbine crossovers at speeds up to 150 ft/sec and pressures up to 150 psi.

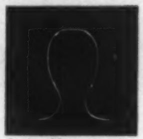
How do you protect piping and turbine casings from the stresses of extreme internal pressure and the expansion such temperature is bound to produce?

Working together, Badger and engineers at General Electric's Large Steam Turbine-Generator Department solved the problem with a new type pressure balanced elbow expansion assembly. Using two separate joints mounted in a T-shape casing (see diagram) the assembly effectively absorbs and controls axial movement. Although the device was custom engineered to General Electric's requirements, the bellows elements are constructed to the Curvilinear Corrugation design recently announced by Badger and now used in all S-R Expansion Joints.

Whether you need standard S-R Expansion Joints or custom equipment, Badger can serve your needs. Get more information — write for illustrated brochure today.

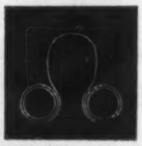
New corrugation and ring designs produce better equalization, "all-curve" flexing

Curvilinear Corrugations used in S-R Expansion Joints were developed by the Badger Research Department. Under operating pressures (white line) the new design produces more uniform movement per corrugation and natural "all-curve" flexing. Stress is reduced . . . life increased.



Series 50 corrugation cross-section

S-R Joints for higher pressures have tubular Reinforcing Rings. These new rings make metal-to-metal contact only in the "valley" of each corrugation allowing natural "all-curve" flexing (white line). Tubular shape permits greater effective flexing height which contributes to longer life.



Series 150 corrugation and ring cross-section

BADGER

S R

SERVICE RATED

EXPANSION JOINTS

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BADGER MANUFACTURING COMPANY
230 Bent St., Cambridge 41, Mass. • 60 East 42nd St., New York, New York
Representatives in Principal Cities

"WE REDUCED INSTALLATION TIME 25%

with PITTSBURGH FIBER GLASS PIPE INSULATION"

says Mr. Charles W. Smith, President
Standard Insulation Products, Inc.
Baltimore, Maryland

Pittsburgh Fiber Glass Pipe Insulation is easily slipped on the pipe. Insulation will be hand stapled in place, eliminating metal strap fasteners.

"We installed 4,800 ft. of Pittsburgh Fiber Glass Pipe Insulation at Our Lady of Fatima School in Baltimore on water, steam and dual-temperature pipes. The handling ease and application speed of this product, compared with the insulation material previously used, saved us 25% in installation time costs.

"The three-foot lengths are easily spread by hand at the seam and are slipped quickly and snugly over the pipe. Hand stapling eliminated the need for metal strap fasteners. For special lengths, the insulation was easily cut with a knife. Wastage was negligible. Cut ends retained their shape with no fluffing. Short left-over pieces were used on fittings.

"The factory-applied vapor barrier eliminates condensation, which reduces future maintenance costs. Outside jackets present a good appearance and can be painted to match room decorations."

SAVE TIME WITH PITTSBURGH PIPE INSULATION

You can order Pittsburgh Fiber Glass Pipe Insulation in a variety of thicknesses and jackets to your own specifications. For complete information, call your nearest PPG Sales Office, or write to *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Penna.*

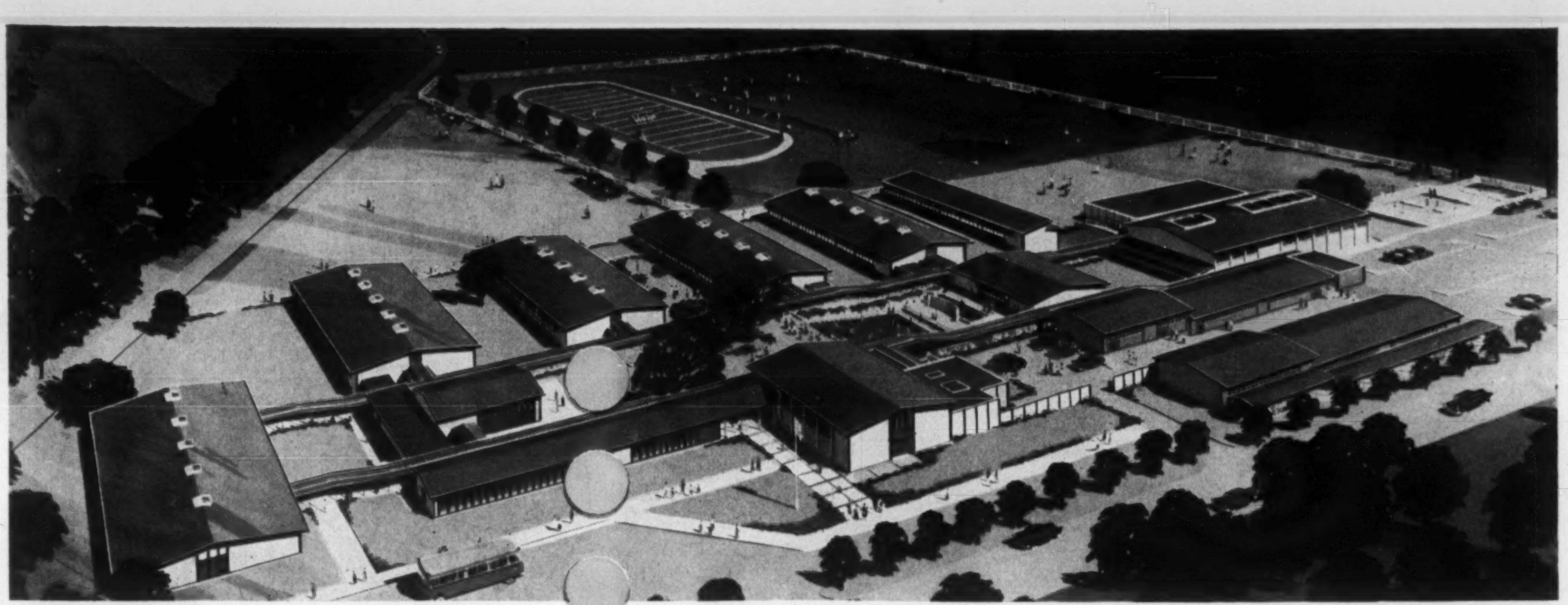
PITTSBURGH PIPE INSULATION IS A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY

Sales Offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, Minneapolis, New York Philadelphia, Pittsburgh and St. Louis

75th ANNIVERSARY 1883—1958

SYMBOL OF SERVICE FOR SEVENTY-FIVE YEARS

PITTSBURGH PLATE GLASS COMPANY

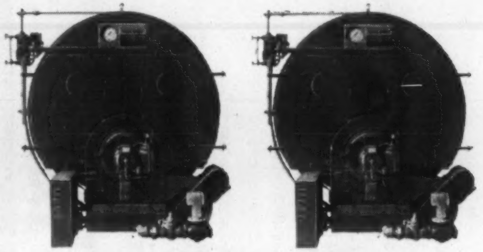


Clayton Valley High School, Clayton, California. Architects: Associated Architects. Consulting Engineer: Clyde Bentley. Heating & Ventilating Contractors: Walnut Creek Sheet Metal & Furnace Company, Inc. and Carstens & Sigler.

Proven heating performance, local service win again for Webco-Ray packaged units

Two dependable Webco-Ray three-pass packaged units were selected to provide safe, silent heating performance for this new $1,901,000 school project. With 5,850,000 BTU/hr output for each boiler, the two Webco-Ray units furnish enough hot water for convectors and unit ventilators to heat the entire school. But one of the big plus factors in choosing Webco-Ray was the local service follow-up. Nearby distributors not only fire, test and adjust the boilers to start with, but follow-up with constant service availability. You deal with one single responsible source when you specify Webco-Ray heating, power and process steam units. And nobody can cover with service like Webco-Ray.

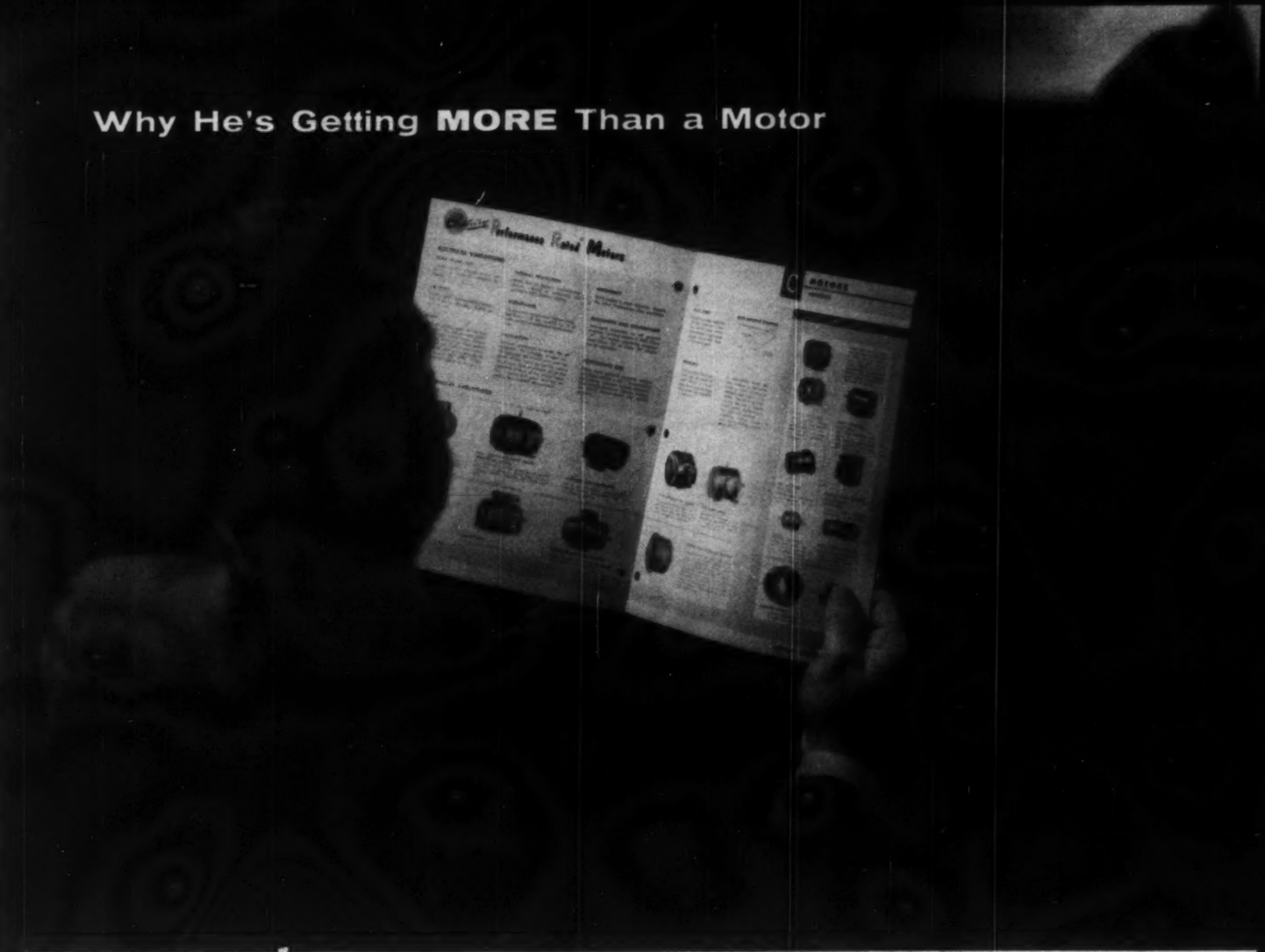
4793



WEBCO
3 PASS PACKAGED UNITS
RAY

WESTERN BOILER COMPANY
1600 N. Indiana Street, Los Angeles 63, California
1309 Eighth Street, North Bergen, New Jersey

Why He's Getting **MORE** Than a Motor



He's getting answers to motor problems the easy way

with the Century Electric Motor Application Guide

Want a quick, easy way to get answers on motor applications? This easy to follow Century Electric motor application guide will help you do just that. Here's how you can make it work for you.

Suppose you need a motor to drive a fan. Knowing your power supply (a-c or d-c) you look on the chart on page 2 for the motor whose characteristics match the load you want to drive. Having done this it's easy to check the mechanical variations (page 8) to find the enclosure you need—depending on whether it is operating in an explosive, moist, etc. atmosphere. Then you have type, dimensions and operating characteristics, all at your fingertips.

Of course, this is good for simple routine applications. If your problem is more complicated, your Century Electric sales engineer will be glad to help. He can sit down with you and offer on-the-spot advice or if necessary get more complete data—drawing and models for you.

Such help explains why you get *more* than just a motor from Century Electric. Century Electric Company, 18th and Pine St., St. Louis 3, Missouri.

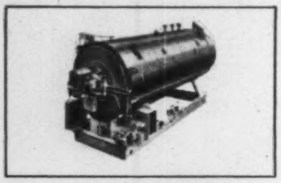
CENTURY ELECTRIC COMPANY

St. Louis 3, Missouri *Offices and Stock Points in Principal Cities*

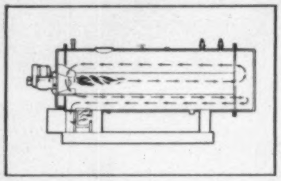
Century

58-3

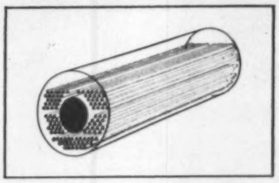
NOW . . . all these "BIG BOILER" features in a compact, economical package . . .



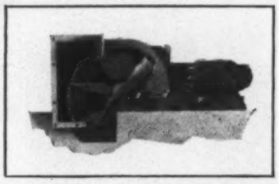
- A complete package including boiler burner, draft equipment, controls and all interconnecting piping and wiring. Completely assembled and factory fire-tested.



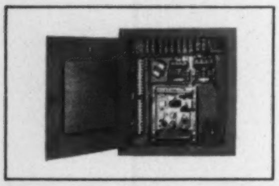
- 4-pass down-draft design, promotes rapid water circulation. Decreasing tube volume in successive passes provides high combustion gas velocities and maximum heat transfer.



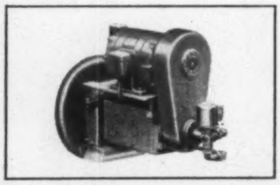
- 5 sq. ft. of heating surface per b.h.p. Units reach conservative ratings with ease. Guaranteed thermal efficiency 80%. Stack temperatures not exceeding 125° above steam or water.



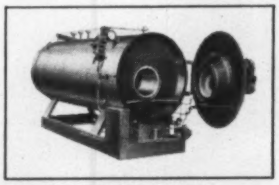
- **Induced draft operating at relatively slow speed results in unusual quiet plus safety from danger of forcing gases out into boiler room. Negative furnace pressure also protects refractory.**



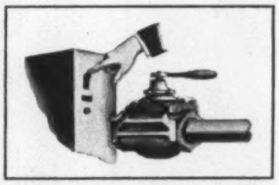
- **Fully automatic** operation firing oil, gas or both. Firing rate adjusts to demand, never overfiring wastefully, but handling sudden increases without lag. Variety of controls available.



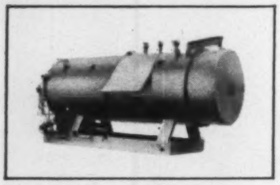
- **Superior Rotary Burners** on all sizes firing No. 4, 5 and 6 oil. Most dependable type of equipment ever devised for burning heavy oils. Burners require minimum supervision, and no lubrication.



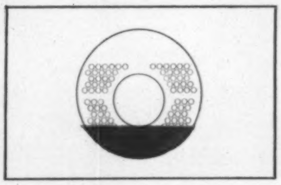
- **Hinged** front and hinged or davited rear door on all units. Doors may be opened simply without removing refractory and are simply and effectively sealed with standard asbestos rope.



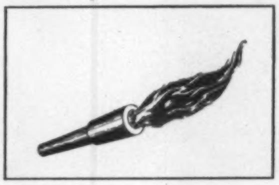
- **Instantaneous fuel changeover.** Units equipped for oil and gas firing may be changed from one fuel to another quickly and simply by operating only a switch and a valve.



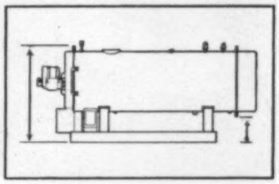
- **Completely insulated** and jacketed. Even the bottom of the boiler shell is covered with 2" insulation. No uninsulated areas for heat loss and unnecessary heating of the boiler room.



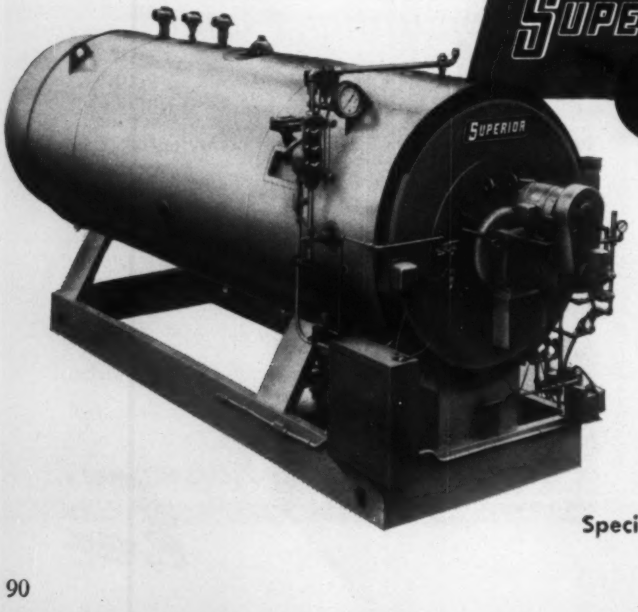
- **Down-draft design** places furnace high in shell, safely away from danger zone . . . completely eliminates bagging and blistering resulting from mud build-up in bottom of boiler.



- **Constant gas pilot** remains lit at all times, prevents accumulation of gas in the furnace which could result from even an almost undetectable leak in the gas valve.



- **Low total height** but with clearance from floor allows ample room under the shell for inspection, maintenance and installation of piping. The COMPACT is practical as well as compact.



SUPERIOR "COMPACT"

Here at last is a boiler which combines all of the most desirable features of big boiler design with an unusual degree of compactness. Ideal for installations where space is limited, it also provides an economical answer both from the standpoint of purchase and installation costs for any application having steam requirements of from 20 to 200 B.H.P.

Pressures to 250 psi, or hot water units also available. Write today for Bulletin 1004C

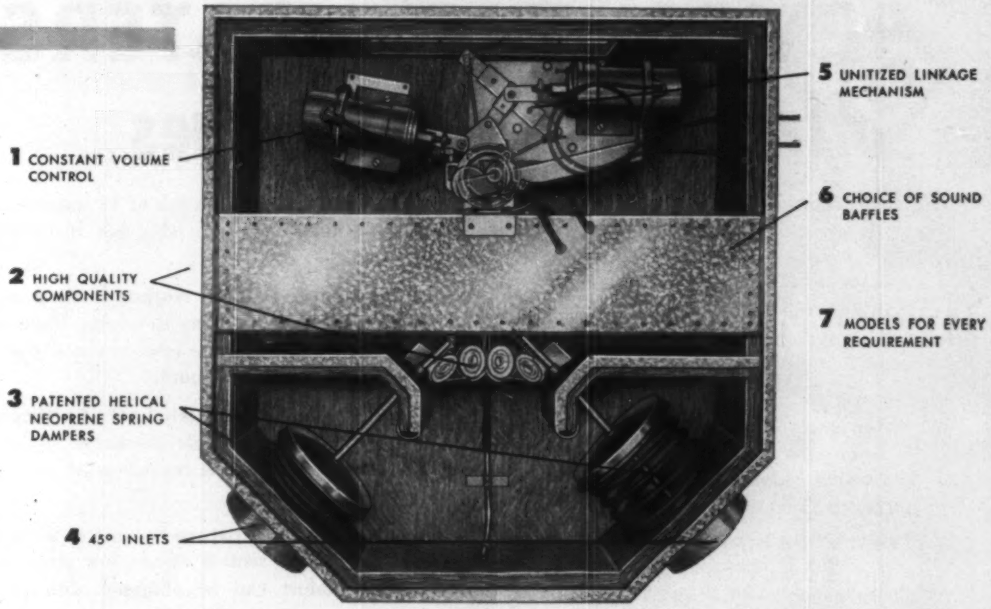
SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

Specialists in PACKAGED BOILERS . . . exclusively

7 ENGINEERING REASONS Why

TO SPECIFY NEW CONNOR KNO-DRAFT

HIGH VELOCITY VALVE ATTENUATORS


1 CONSTANT VOLUME CONTROL
2 HIGH QUALITY COMPONENTS
3 PATENTED HELICAL NEOPRENE SPRING DAMPERS
4 45° INLETS
5 UNITIZED LINKAGE MECHANISM
6 CHOICE OF SOUND BAFFLES
7 MODELS FOR EVERY REQUIREMENT

SHOWN HERE are seven sound reasons why new Kno-draft "Series 45" Valve Attenuators meet every test of high velocity systems . . . assuring better balanced air delivery and constantly controlled air diffusion.

CONSTANT VOLUME CONTROL insures constant air volume despite static air fluctuations. Single adjustment of pressure regulator balances total air volume. All constant volume units use standard components of control manufacturers actuated by 15 psi air pressure.

HIGH QUALITY COMPONENTS: galvanized steel casing, vinyl coated acoustical absorbing material, nylon pulleys, stainless steel aircraft type cable.

PATENTED HELICAL NEOPRENE SPRING DAMPER positively assures complete close-off . . . full heating and cooling realized because damper shuts with less than 2% leakage.

45° INLETS mean fewer elbows required in take-off ducts, reducing static pressure losses and installation costs.

UNITIZED LINKAGE MECHANISM reduces friction, eliminates control lag, insures precise temperature regulation, permits easy servicing.

CHOICE OF SOUND BAFFLES: internal flat plate for quiet operation; patented sinuous baffle for use when maximum sound attenuation is demanded.

MODELS FOR EVERY REQUIREMENT: Open End, Diffuser, Integral Grille, Linear Diffuser, Under-Window.

The outstanding performance of the "Series 45" can only be matched by using its features.

CONNOR . . . for Constant Comfort Conditions

CONNOR
ENGINEERING
CORPORATION
kno•draft®
high velocity air diffusers

CONNOR ENGINEERING CORPORATION

82 SHELTER ROCK ROAD • DANBURY • CONNECTICUT

ONLY

Wing

REVOLVING HEATERS

offer all these advantages

Hot Blasts and Cold Spots Eliminated In Wing Revolving Unit Heaters, the warm air outlet rotates slowly and continuously. This movement of the revolving outlet sets up a gentle air motion which distributes the heat evenly, and eliminates those hot and cold spots caused by stationary heaters.

Because of the constantly changing direction of the warm air, it finds its way around obstructions, such as machinery in manufacturing plants, cars and buses in repair garages, airplanes in hangars, etc.

Fewer Wing Heaters Needed The old concept of unit heaters spaced every 60 or 80 feet doesn't apply with Wing. Wing's largest Revolving Heater, for example, covers over 125′ x 125′.

In a large building this means fewer heaters, much lower installation and maintenance costs. In a building 125′ x 420′, for instance, 4 Wing Revolving Heaters do the job of 12 stationary heaters–without uncomfortable hot blasts or cold spots.

60 Foot Ceilings, And Higher Many thousands of high ceiling Wing Revolving Heaters have been installed where efficiency and comfortable heat are paramount.

Equally Effective with Low Ceilings Wing's line of adjustable discharge outlets provides efficient heating regardless of ceiling height.

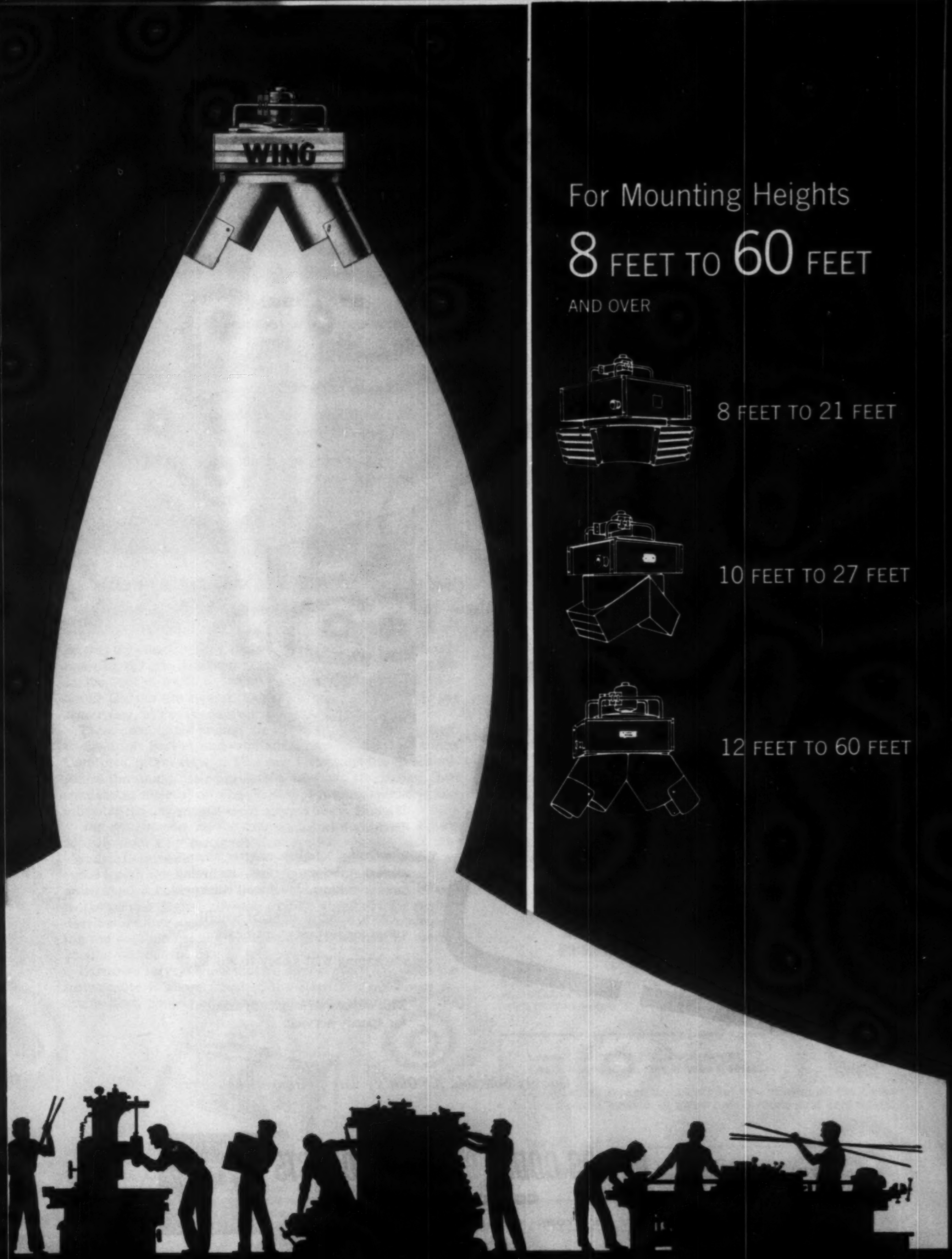
Low Outlet Temperature Because of Wing's exclusive heating section design, low pressure heating comfort can be obtained with any steam pressure up to 200 psi.

For complete detailed information on Wing's line of Revolving Unit Heaters contact your local Wing Representative or write our Main Office in Linden, N. J.

L. J. Wing Mfg. Co.
DIVISION OF AERO SUPPLY MFG. CO. INC.
140 VREELAND MILLS ROAD, LINDEN, NEW JERSEY
FACTORIES: LINDEN, N. J. AND MONTREAL, CANADA
IN EUROPE: WANSON, HAREN-NORD, BRUSSELS, BELGIUM

OTHER WING PRODUCTS:
- Fresh Air Supply Heaters
- Draft Inducers • Fans
- Turbine and Motor Blowers
- Auxiliary Turbines

WC101


WING
For Mounting Heights
8 FEET TO 60 FEET
AND OVER
8 FEET TO 21 FEET
10 FEET TO 27 FEET
12 FEET TO 60 FEET

PHELPS DODGE
COPPER WATER TUBE

SPECIFY COPPER
TUBE AND PIPE MADE
THE QUALITY WAY . . .

MADE
IN
U.S.A.

BECAUSE:

- You are assured of *consistent* quality time after time.
- You support your fellow American workers.
- You help build your reputation and America's prosperity.
- You can count on a reliable source of supply.

TYPES K, L, M, DWV,
COPPER AND BRASS PIPE

The All-American Line From Mine to Market

PHELPS DODGE
COPPER
WATER TUBE

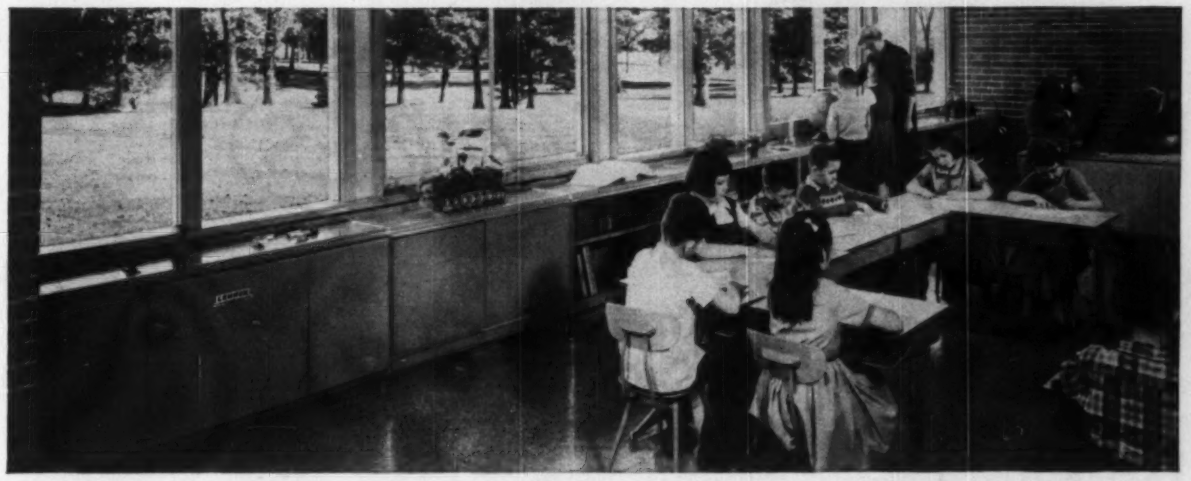
- Highest grade copper from Phelps Dodge's own mines.
- Controlled quality assures unsurpassed tube properties, including precise uniformity of wall thickness.
- Color-coding of straight-length tubes for instant identification.
- Packaging that's easy to stock, easy to use.
- Mill depots strategically located for speedy service.

Quality tube sold the Quality way—through wholesalers

PHELPS DODGE COPPER PRODUCTS
CORPORATION
NEW YORK, N. Y. • LOS ANGELES, CALIF.

MADE IN U.S.A.
TO THE STANDARDS
OF AMERICAN INDUSTRY

Fresh air heating and ventilating for classrooms...for as little as $1.03 per square foot!



New Lennox Comfort Curtain system automatically draws in fresh air from outside...warms, cleans, circulates air... provides tons of needed cooling without the cost of refrigeration!

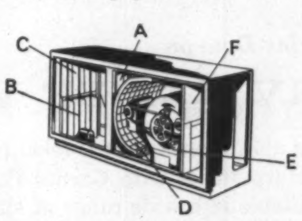
Across the country, the Comfort Curtain system is drastically reducing the cost of school heating and ventilating. Costs per square foot of $1.03 in Indiana, $1.15 in Montana, $1.12 in South Dakota are typical. One job went in for *just 65c per square foot*, in Potosi, Missouri!

These exceptional savings are the result of a new approach to classroom heating and ventilating, provided by the Lennox Comfort Curtain system. This new system applies to schoolrooms the sound, tested principles of warm air heating, thus eliminating the cost of pipes, boilers, towering chimneys and inflexible heating plants.

And most important, the Lennox Comfort Curtain system actually does a *far better* job than costlier systems used previously. It provides a full, even flow of air throughout its entire length along the exposed classroom wall. It is amazingly quiet. And it holds room temperatures to a variance of six-tenths of one degree, circulates air continuously for perfect distribution, introduces a continuous supply of fresh air during the daytime heating cycle, and provides *tons* of needed cooling without the cost of refrigeration.

Extensive surveys show that on almost every day when the temperature is above freezing, the classroom no longer requires heat, shortly after pupils assemble. True, at 33° the average classroom needs about 20,000 Btuh. But 30 pupils will generate about 12,000 Btuh, lighting will add another 8,000 to 10,000 Btuh, and the sun load can account for as much as 15,000 Btuh. Since the amount of heat being generated exceeds the classroom heating requirement, it becomes necessary to *cool* the classroom to maintain a healthful, comfortable temperature. The Lennox Comfort Curtain system does this automatically by introducing cool, fresh outside air.

There is today no possible way to achieve all these advantages at so little cost—except with the Lennox Comfort Curtain. The system is completely flexible, uses child-proof wall- or bookshelf-ducts, installs readily in any size or design of school, comes completely equipped with a "laboratory matched" control system. Send coupon below for free booklet.



The Lennox Air Processing Unit introduces fresh air in adjustable volumes (A); transmits warm air (B) from adjacent or remote heating unit; continuously recirculates indoor air (C); filters air clean (D). Lennox' exclusive floating blower (E) and acoustical lining (F) assure a degree of quietness never before achieved.

LENNOX

© 1958 Lennox Industries Inc., founded 1895; Des Moines and Marshalltown, Ia.; Syracuse, N.Y.; Columbus, O.; Decatur, Ga.; Ft. Worth; Los Angeles; Salt Lake City. In Canada: Toronto, Montreal, Calgary, Vancouver, Winnipeg.

Lennox Industries Inc., Dept. HP-83
1701 E. Euclid Ave., Des Moines 5, Iowa

Gentlemen: Please send me your free booklet on the Comfort Curtain system of classroom heating and ventilating.

NAME______________________________

ADDRESS___________________________

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CITY________________ZONE____STATE________

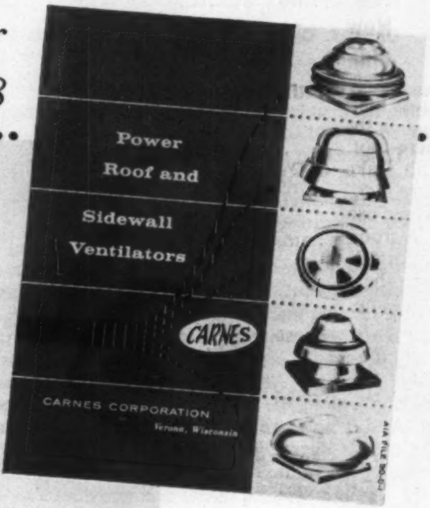
Now!

COMPLETE SPECIFICATIONS ON THE

CARNES

LINE OF POWER ROOF VENTILATORS

Write for
NEW CATALOG V-58


Power Roof and Sidewall Ventilators
CARNES
CARNES CORPORATION
Verona, Wisconsin

CARNES CORPORATION
Dept. HP58
Verona, Wisconsin

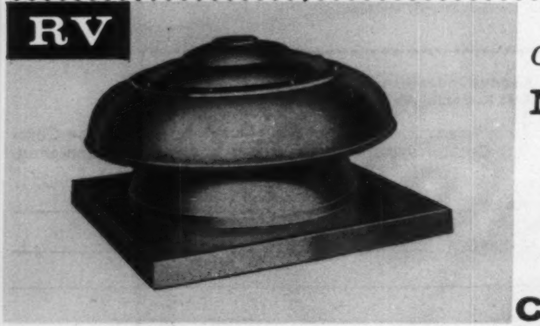
Send me your new catalog No. V-58, on Carnes Power Roof Ventilators.

NAME______________________________

COMPANY______________________________

STREET______________________________

CITY____________ZONE______STATE__________



Catalog Also Contains Data on

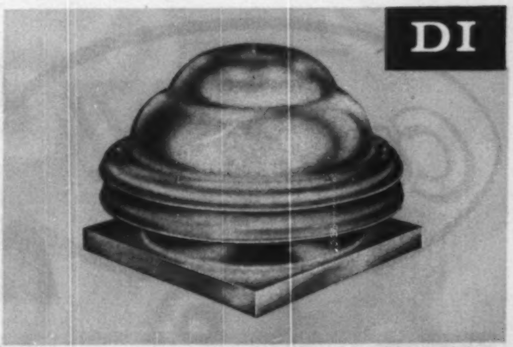
MODEL RV RELIEF VENT

The heavy gauge aluminum vent for relief of positive pressure areas. Harmonizes with Carnes Power Roof Ventilators—available in a wide range of sizes.

CARNES corporation *Verona, Wisconsin*

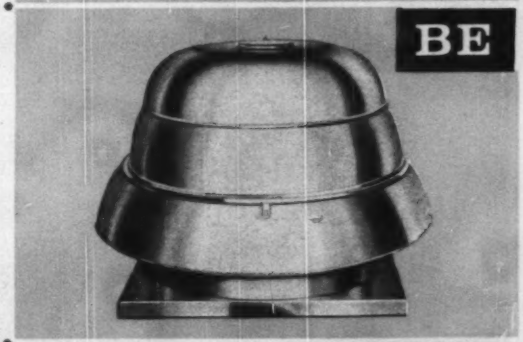
MODEL DI

Type: Centrifugal Power Roof Ventilator
Housing: Spun Aluminum
Sizes: 7″ through 13″
Capacities: 125 CFM to 2,040 CFM



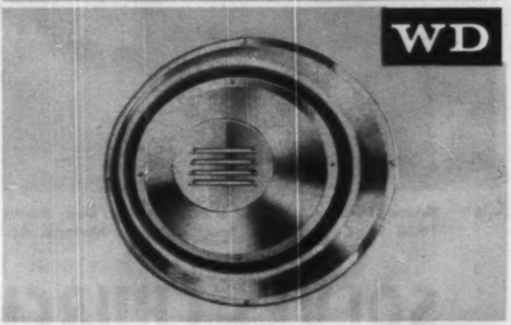
MODEL BE

Type: Centrifugal Roof Ventilator
Housing: Spun Aluminum
Sizes: 10″ through 48″
Capacities: 430 CFM through 23,520 CFM



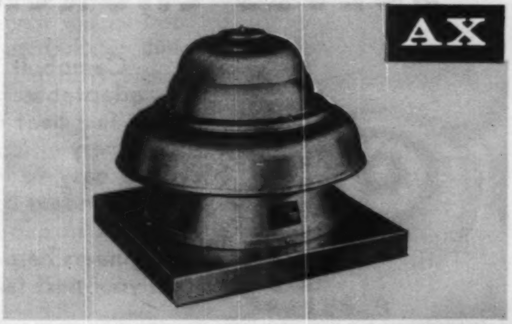
MODEL WD

Type: Centrifugal Sidewall Ventilator
Housing: Spun Aluminum
Sizes: 7″ through 14″
Capacities: 120 CFM through 2,295 CFM



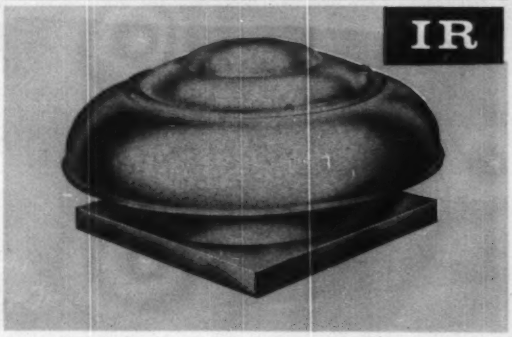
MODEL AX

Type: Axial Flow Roof Ventilator
Housing: Spun Aluminum
Sizes: 10″ through 24″
Capacities: 475 CFM to 4,140 CFM



MODEL IR

Type: Fresh Air Intake and Pressure Relief
Housing: Spun Aluminum
Sizes: 12″ through 46″
Capacities: 300 CFM to 11,500 CFM



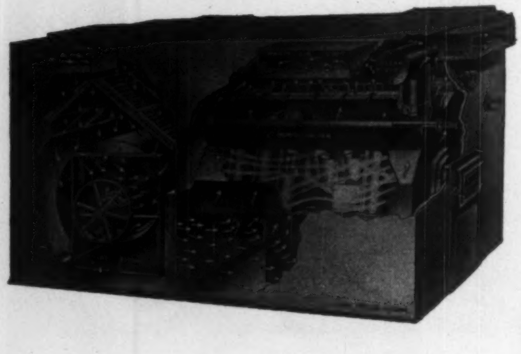
Campbell

WARM AIR HEATERS FOR LARGE BUILDINGS

Grace Evangelical Lutheran Church, Des Moines, Iowa, heated with two gas-fired Campbell heaters installed in 1955 by Corn States Metal Co., Des Moines. Architect, Gerald Griffith; engineer, Dan Stevenson, both of Des Moines.

SOLVES CHURCH HEATING PROBLEMS

Campbell Warm Air Heaters are especially adaptable for church installations. They provide the fast heat delivery that is only possible with an extremely efficient warm air unit. Campbell Heaters are easy to install, operate very quietly, and deliver abundant heat with amazing fuel economy. For all fuels in capacities up to 3,150,000 BTUs. Let our engineers help you with layouts and specifications on your next large heating job.



MANUFACTURERS' AGENTS

We have some very attractive openings for men calling on heating contractors and architects.

CAMPBELL
HEATING COMPANY

DES MOINES 17, IOWA

— Packaged Combustion —

Webster

COMBUSTION SAFEGUARD SYSTEMS

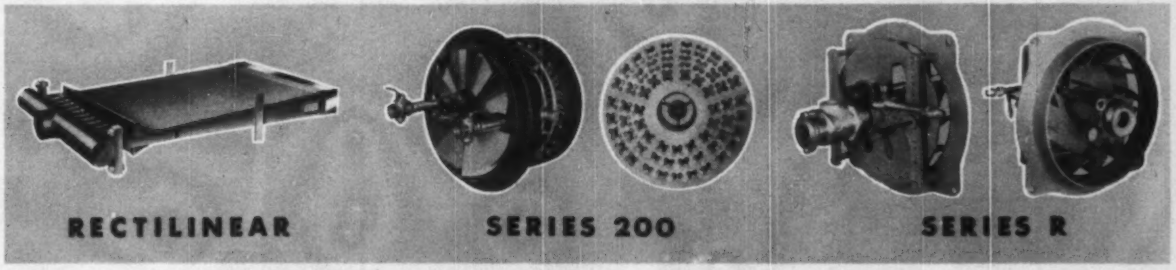
CONTROL CABINETS

Complete control cabinets for any type of combustion system.

Entire control unit is engineered, fabricated and tested at the factory with the Webster burners specified for the installation.

All external components are included as a part of the Webster packaged unit.

Webster control and combustion equipment will be installed, adjusted and tested under direct supervision of a technical representative.



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Write for Bulletin AP-5/1 Series — Control Systems and Webster Burner Catalog.

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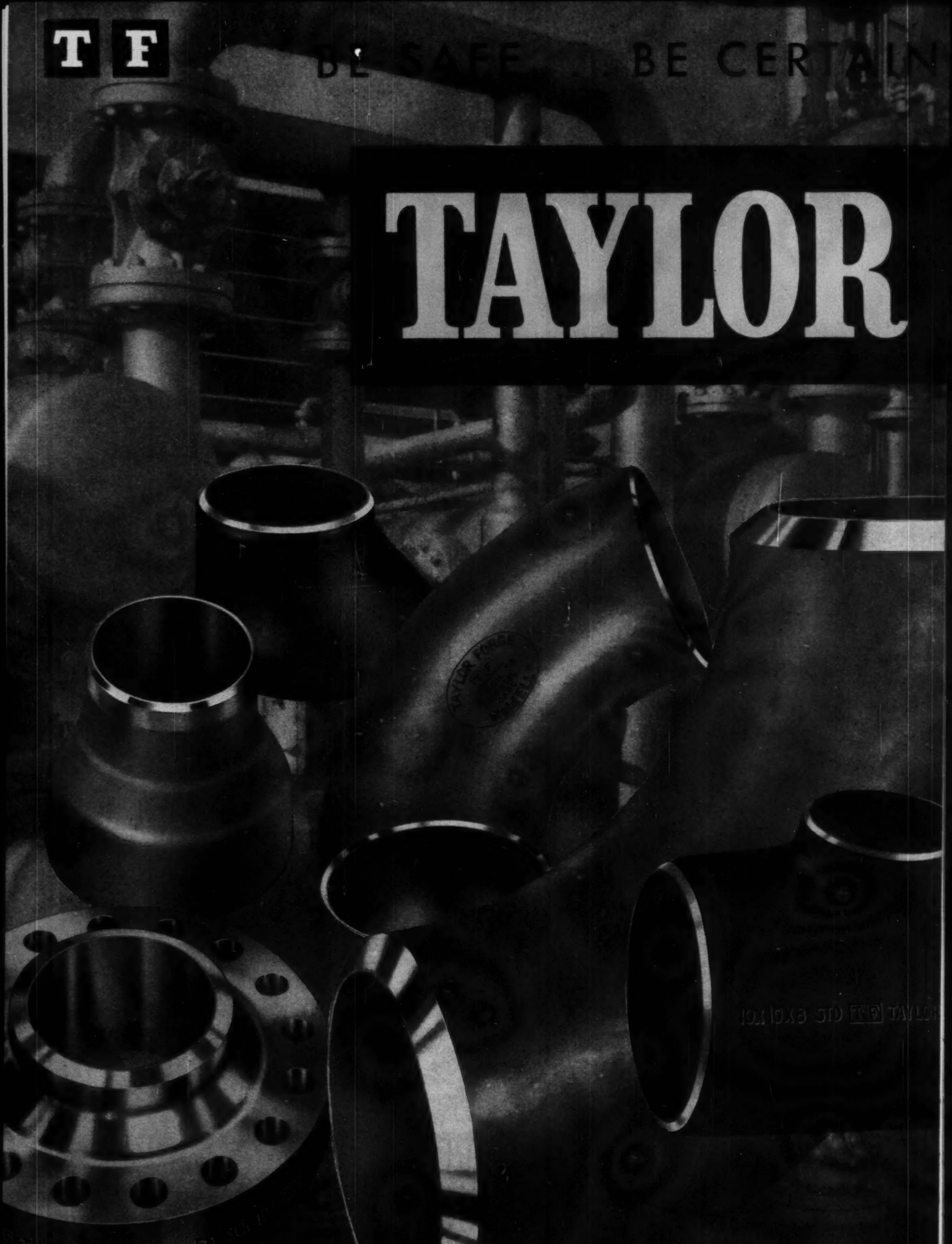
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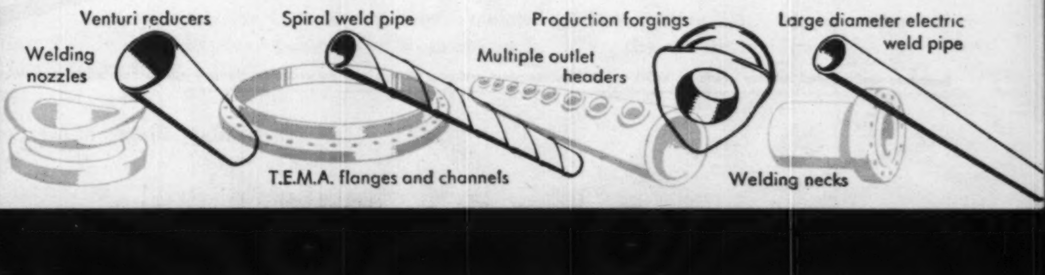
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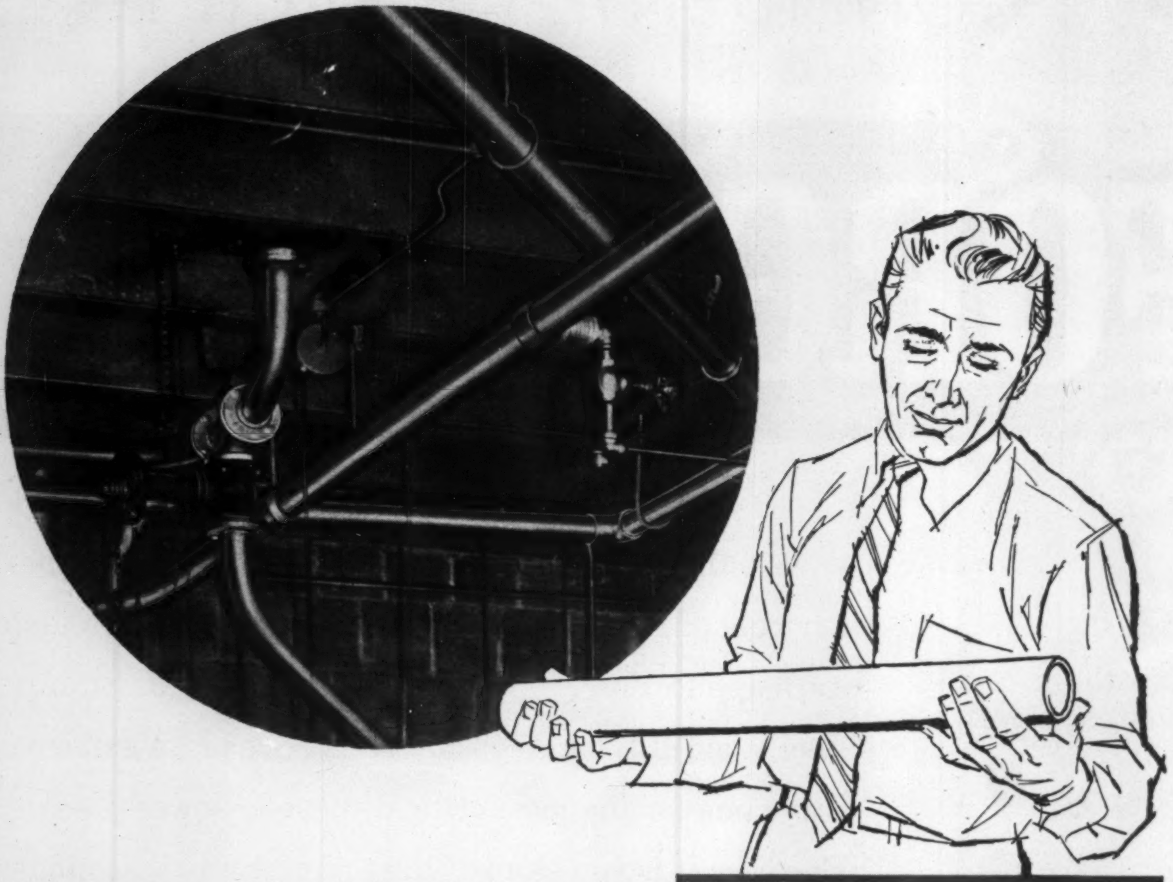

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Construction Outlay Up "As Usual" in March

. . . about $3.4 billion spent

THE DOLLAR value of new construction put in place rose as is usual in March, to approximately $3.4 billion, bringing the first quarter total to $9.7 billion—a little above the total for the first quarter of 1957, according to estimates of the U.S. Depts. of Commerce and Labor. The physical volume of new construction for the first quarter, however, probably has not risen over the same period of last year.

The latest quarterly estimate reflects a 7 percent rise in public construction from the same quarter of 1957, due primarily to rising expenditures for public housing and highways.

Private construction outlays in the first quarter of 1958 were unchanged from the comparable quarter of last year, with residential building accounting for the same proportion of the private total in both periods. ‡

Future Building Contracts Show 10 Percent Decrease

. . . for February

CONTRACTS for future construction in the U.S. in February totaled $1,953,422,000, a 10 percent decrease from February 1957, according to F. W. Dodge Corp. This marked the second consecutive month in which contracts registered a 10 percent decline.

Dollar volume of contracts in the residential category amounted to $727,282,000, down 17 percent from the like month of a year ago. However, apartment units again registered an increase, this time 2 percent. The number of dwelling units of all types totaled 59,172 a drop of 14 percent compared to February 1957.

Contracts in the nonresidential category totaled $750,819,000, a decrease of 8 percent. The decline was due primarily to decreases in contracts for manufacturing and commercial buildings. Hospitals also showed a sharp decrease. However, contracts for educational and science buildings were up 2 percent.

Heavy engineering contracts in February totaled $475,321,000, a gain of 2 percent above the like 1957 month. A gain of 29 percent was reported in public works, but utility contracts dropped 38 percent.

The cumulative total of contracts for the first two months of 1958 amounted to $4,013,416,000, down 10 percent from the like period of 1957. Cumulative totals of contracts in the major construction categories showed: nonresidential at $1,507,111,000, down 13 percent; residential at $1,501,212,000, down 11 percent; and heavy engineering at $1,005,093,000, down 3 percent. ‡

Snow Melting Needs of Super Highways To Spur Trend to Big Piping Installations

. . as evidenced by Chicago Skyway job

MODERN HIGHWAYS need extensive piping and heating facilities—as well as concrete and reinforcing steel. With the signing last month by President Eisenhower of the interstate highway bill, which puts additional federal funds into road and street construction this year, there will be many more applications of snow melting to improve traffic safety conditions and prevent traffic jams.

At Chicago's $101 million Calumet Skyway (see front cover), opened to traffic April 16, over 75,000 ft of ¾ and 1¼ in. steel pipe is embedded in the concrete for snow melting at the 22 lanes of the toll plaza.

Chicago Conditionaire Co., the piping and heating contractor, fabricated the welded pipe grids in a specially constructed shed at the job site to speed installation. Steel chairs supported the grids during the pouring of the concrete.

Some 5000 gal of heat transfer oil fills the grids and will be circulated by three pumps. The oil is heated in an exchanger supplied with steam from two No. 6 oil fired package boilers which also furnish steam for heating the toll plaza service building and garage.

The pavement will be kept warm throughout the winter (probably at 20 F) so that it can be brought up quickly to snow melting temperature.

In addition to tests of the grids with an air pressure of 125 psi, and of individual sections and pipes with water at nearly 700 psi, a mixture of ammonia and air was used in a final test of the installation because danger of freezing prevented use of water. Sulfur candles were passed along the joints to indicate any leakage of ammonia.

Consoer Townsend & Assoc. were the consulting engineers, with DeLeuw Cather & Co. the supervising engineers for the city. Kenny Construction Co. was the general contractor for the Skyway, and Ashland Construction Co. was the contractor for the service building. ‡

Fallout Studies Supply Air Pollution Information

. . . Government is taking active part

STUDIES of radioactive fallouts from atomic bombs are providing valuable information about air pollution from factories, it was stated at the recent Plant Maintenance & Engineering Conference at Chicago.

Harry C. Ballman, manager, field engineering services, Bituminous Coal Institute, said that the Federal government is taking an active part in these studies.

"With the radioactive fallout studies presently being made by the Federal government, air pollution control activities are coming more and more before the public eye," Mr. Ballman warned. "Information gained from study of fallout will do much to further our techniques and interests in the study of other air pollutants."

He hailed the development of legislation which, since World War II, has brought air pollution control under agencies with wider geographical authority, first from the city and town to countywide areas and, more recently, into wide district areas.

"In the past, plants have moved away from the restrictions imposed on them by metropolitan areas. Today this may not be done in those instances where the boundaries of control have expanded. Greater industrialization and larger population require more mass transportation, water supply, and labor, and these, in turn, are becoming more restrictive. In some instances we may be temporizing with air pollution problems and invoking other problems. Air pollution can be controlled once we adjust ourselves to accept the task," Mr. Ballman said. ‡

Compressor Shipments Off But Larger Units Gain

. . . '57 total down 12 percent

MANUFACTURERS' shipments of compressor bodies for 1957 totaled 3,956,505 units (not including compressors for household refrigerators), a drop of about 12 percent from the 1956 total, according to the Air-Conditioning and Refrigeration Institute.

Decreases in shipments from 1956 figures were noted in all categories except 2, 10, 25, 30 and over hp. and in automotive compressor units.

Shipments of 2 hp compressor bodies in 1957 were 225,749 units, compared with 70,118 in 1956. Lesser gains were reported for 10, 25, and 30 and over hp units. ‡

Urges High Tariff On Copper Imports

. . . to preserve economy

CONGRESS must guard against low cost foreign production when demand is low if American copper mining is to be preserved, Robert G. Page, president of Phelps Dodge Corp., said recently.

"Legislation has been introduced in Congress to raise the socalled peril point from 24 cents to 30 cents per lb and the import tax to 4 cents per lb, and we believe that such legislation merits serious consideration by Congress.

"An active, healthy domestic mining industry is vital to our national security. The proposed legislation makes for a minimum of interference with foreign trade, since there is no import tax when the copper price is 30 cents or above. But unrestrained importation of low cost foreign production must be guarded against when demand is low if domestic copper mining is to be preserved, in the nation's interest, as a going and healthy industry," said Mr. Page.

He reported that world production of copper continued to exceed global consumption in 1957 and has continued into 1958 with excess output in 1956 amounting to 194,000 tons and 75,000 tons in 1957. While foreign production increased about 54,000 tons in 1957 over the previous year's production, domestic production decreased about 48,000 tons, he reported. ‡

"Quote"

"The customer runs this country, not the management, not the engineers, but I say the best and most successful companies in this world are those that run the best errands for their customers, and the engineer that is successful is the fellow that has run the best errands for his company. And in research, the ones who are the most successful are the ones who run the best errands for their projects." — *Charles F. Kettering, Director of Research Emeritus, General Motors Corp. at the cornerstone laying ceremonies for the Cleveland Engineering and Scientific Center.*

Gas Sales, Revenues Reach Record Highs

. . . during 1957

GAS UTILITY and pipeline industry sales and revenues reached new all-time highs in 1957, exceeding earlier estimates reported in the industry's annual year-end review issued by the American Gas Association, it is reported.

Gas sales climbed to a record peak of 75,617 million therms during 1957, a 3.8 percent gain over the 72,846 million therms sold in 1956. Revenues from sales to ultimate consumers topped the $4 billion mark, totaling $4,072 million in 1957 for a gain of 6.2 percent over the previous year.

Sales during January 1958 continued an upward trend set in the last quarter of 1957. January sales amounted to 8799 million therms, 5.5 percent higher than a year ago when the month's sales totaled 8339 million therms.

Gas utility and pipeline construction expenditures showed a substantial gain in the last quarter of 1957, hitting $559 million for an increase of 18.2 percent over the fourth quarter of 1956. Construction expenditures last year also set a new record, totaling $2010 million. ‡

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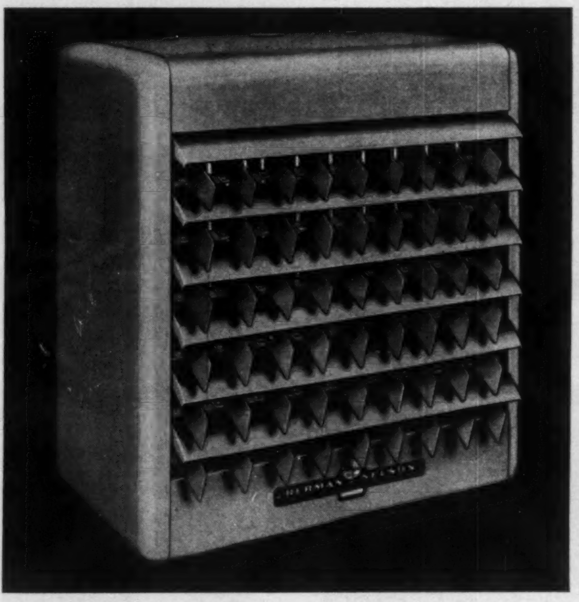

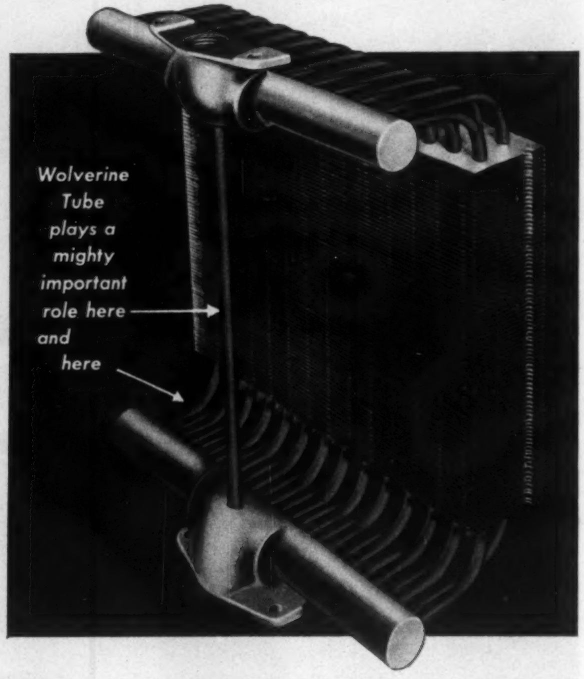
Wolverine Tube plays a mighty important role here
and here

Illustrated here is one of many different unit heaters manufactured by Herman Nelson Division of the American Air Filter Company, Inc., of Louisville, Kentucky. It is designed to keep old Jack Frost outdoors where he belongs.

These heaters supply solid inside comfort to stores, shops, factories and offices. Some are even used in aircraft hangars!

Playing an important role in the efficiency of these units is 85-15 red brass tubing manufactured by Wolverine Tube. This tubing is used as the heating element for both condenser tubing — to which Herman Nelson applies aluminum fins—and as a patented "stay tube".

The exclusive "stay tube" is used by Herman Nelson to maintain a constant relationship between the supply and return header during the initial warm-up period . . . and because of its extra heavy wall thicknesses to withstand the attack of the corrosive gases encountered in the condensate. During the application of fins to the condenser tube and during Herman Nelson's testing program this high quality Wolverine red brass tube is expanded by 2500 psi hydraulic pressure and successfully passes air and water tests. This rugged heating element is described by Nelson engineers as "The heart of the Herman Nelson Unit Heater".

This is but another example of the many uses to which American industry puts the tubular products of Wolverine Tube. If your product uses copper or copper-base tube why not follow Herman Nelson's example—*specify Wolverine Tube*. For the complete story of Wolverine's product line write today for your copy of the General Products Catalog.

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"Open for Discussion"

• *WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

Careful Water Treatment a Must For Process Cooling Applications

I HAVE READ the article, *Cooling Towers, Cold Water Piping Serve Process Cooling Applications,* by James C. Bishop, in the April issue. Water treatment for this type of circuit is of extreme importance. Scale formation and corrosion will be fastest in the cooling portion of the welding equipment as this is where heat transfer will take place. Analysis of the raw cooling tower water to be used for makeup is very critical as its nature will determine the types and amounts of water treatment chemicals to be used. It will also govern the amount of water that must be run to waste in order to maintain the required cycles of concentration in the cooling tower water.

Diesel engine manufacturers found out years ago that it is necessary to use heat exchangers consisting of a closed circuit for the jacket water and an open circuit in the tower. Evaporative coolers have been used for this purpose with quite some success as have air cooled coolers in smaller installations. We do not favor open coils in a cooling tower, but would prefer a shell-and-tube heat exchanger with the tower water inside the tubes and the coolant water outside.

A controlled volume chemical feeder should be used to pump the treatment effluent into the open circuit.

The chances are that a small section of the detachable piping will not show the maximum scaling conditions that would be found in this circuit. This will occur directly at the heat transfer points of the welding equipment.

C. M. STERNE
Chief Engineer
Metropolitan Refining Co., Inc.
Long Island City, N. Y.

THE AUTHOR'S REPLY—Mr. Sterne's comments are appreciated. I have seen return piping so full of scale and oxide due to improper water treatment that production welding became impossible.

The deposits do not form noticeably on the welding electrodes, as these points are hollow with a dip tube inside of them. The dip tube is ¼ in. OD brass pipe. There are two reasons why one never sees much deposit on them:

1) About ¾ gpm of water is forced through an area equivalent to about a 7/32 in. pipe. This results in a velocity of 65 fps.

2) There is a maintenance man stationed on the line who continually dresses these points. After dressing them several times he replaces them. This replacement occurs sometimes daily, depending on use. Due probably to the high water velocity, the precipitating solids are swept to where a velocity change occurs, namely in the return piping. Production welding cannot be shut down for piping inspection. Therefore a bypass should be arranged to permit this.

Regarding cooling towers, a shell and tube condenser is good for a diesel engine or air compressor job where there is not much of a cooling problem. When the temperature of the cooling water is close to the outside air wet bulb temperature, the desired cooling rate cannot be expected to be achieved through an additional heat transfer medium unless a very large tower is used. We designed the system discussed in my article on the basis of an 8 F deg approach temperature. True, heat equals weight of water × temperature rise, but enough water cannot be forced through the critical heating surfaces to use very warm water.

JAMES C. BISHOP
Plant Engineer
Detroit, Mich.

Underground Temperature, Heat Gain Data Differ Between U.S., Sweden

THE article, *Success of Underground Structures Depends on Air Conditioning,* by Thomas H. Urdahl, in the April issue, gives a good and very interesting view of the subject.

There are only two points on which I would have given slightly different values. One is the room temperature for the factory application where 76 F is given. In Trollhattan, Sweden, we maintain the temperature at about 68 F most of the year. There is an increase of about 4 F deg during the warmest summer months. Of course, there may be a considerable difference between American and Swedish habits in this respect.

The other point concerns the heat gain calculation for the shelter case. The author has based this on the usual assumption of 400 Btu per hr (200+200) being the total heat quantity dissipated from the people in the shelter. The scientific authorities consulted by our civil defense board, however, recommend that a figure of 600 Btu per hr (150 kcal per hr) should be applied—depending on the increase of heat production that is caused by mental stress.

AXEL ROSELL
Axlander & Rosell
Consulting Engineers
Stockholm, Sweden

Articles on Underground Structures Illustrate Engineer's Important Role

FROM the articles, *Success of Underground Structures Depends on Air Conditioning*, by T. H. Urdahl, in the April issue, and *How Underground Workshops Are Made Livable*, by Axel Rosell, in March, one realizes the important role of the engineer and physiologist, not only in providing a proper workshop environment, but in adapting these structures for protection against nuclear weapons effect.

As pointed out by Mr. Rosell, the need to remove air vitiated by industrial processes such as grinding, polishing, and spray painting is primary. Were this not so, or if such areas could be segregated, then a complete shutdown of ventilation could be enforced for many hours in accordance with the submarine formula:

$$T = 0.04\ (V/N)$$

where:

T = time to reach 3 percent CO_2 after closure, hr
V = net air space, cu ft
N = number of occupants.

This formula reflects body heat loss of about 500 Btu per hr.

With reference to the effects of wide fluctuations of temperature and drafts, it is possible for healthy individuals in hot summer to expose themselves in water for periods up to 1 hr (an extended Finnish Sauna) without ill effect. In the hot spaces of ships, the exposure of watch standers to blasts of cold air or to spot cooling is regular practice. Discomfort is not synonymous with injury.

It requires weeks of continuous exposure with foot skin temperature maintained at 60 F, for example, to produce a chilblain type of injury. On the other hand, there are "cold" sensitive individuals, actually patients, who require a narrow range of temperature conditions for well being. Engineering problems in connection with shelters may be resolved in part by segregating cold sensitive individuals.

Individual protection particularly of the head and neck will prevent the radiant loss of appreciable quantities of heat and will minimize discomfort which would otherwise occur.

Mr. Urdahl translates his experience and notable contributions to the ventilation and air conditioning of surface ships and submarines during World War II to underground structures. Upper limits for temperature and humidity are those which do not induce body sweating; specifically, temperatures such that water loss from the body is entirely insensible (approximately 900 cc per 24 hr). In submarines these limiting values are 75 to 78 F effective temperature. Lower temperature limits are those which affect manual dexterity <55 F.

Regarding submarine personnel, it is possible to determine accurately their caloric requirements as measured by food consumption (about 3000 Cal per 24 hr), oxygen utilization (0.9 cu ft per hr), and CO_2 output (0.75 cu ft per hr). This is equivalent to approximately 500 Btu per hr and, within the limits suggested by Messrs. Urdahl and Rosell, is applicable to occupants in shelters.

A. R. BEHNKE
Captain (MC) USN
Radiological Medical Director
U. S. Naval Radiological Defense Laboratory
San Francisco, Calif.

Equivalent Lengths for Ducts Not Dependent Upon Velocities

THIS is with reference to the December 1957 Data Sheet, *How to Find Equivalent Lengths of Elbows in Rectangular Ducts*, and particularly the comments by Messrs. Voorhees and Eubanks on these "Open for Discussion" pages in the March issue.

Replying to Mr. Voorhees' question concerning velocities, Mr. Eubanks has given an excellent summary of the analysis covered in my paper. I would like to comment further on the question of velocities:

Introduction of the friction factor, f, into the correlation of loss coefficient, k, has the effect of accounting for variations in roughness, duct size, density, viscosity, and velocity. Tests run with both water and air with widely different sizes and roughnesses were brought into reasonable correlation by this method. An interesting illustration is the way in which Dr. A. C. Willard's data on models for the Holland Tunnel elbows could be correlated: k/f values were nearly constant for a 1/10 scale sheet metal model and a 1/5 scale concrete model, covering a range of Reynolds numbers from 200,000 to 2 million. The test data from which Mr. Eubanks' charts were derived covered Reynolds numbers in the range of 80,000 to 800,000. Thus, the design data is relatively independent of velocity in the normal range for heating and air conditioning ductwork.

The assumption of a linear relationship between k and f may not hold precisely for all conditions of approach velocity distribution but is considered sufficiently accurate for design calculations. Where a high degree of accuracy is required, experimental model studies of the system should be considered.

DAVID W. LOCKLIN
Senior Mechanical Engineer
Battelle Memorial Institute
Columbus, Ohio

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Question of the Month

How Do Wind Loads Affect Stability of Pipe Supports?

This question was asked previously in Heating, Piping & Air Conditioning and is repeated here, along with an answer that has been received from a reader. Other answers or comments for publication are invited.

> *"We understand that wind loading on pipes is often included in some general provision for lateral stability in designing the supports for partially shielded piping. How to include these factors in the design of such piping is of real interest to us. What shielding effect from wind, if any, can be expected from one pipe on another which has been placed behind it? A brief statement of our immediate problem is as follows:*
>
> *"The pipe supports will carry 60 pipelines varying in diameter from 2 to 6 in. This will be arranged in four layers and will cross an open field.*
>
> *"The locality is subject to hurricanes. Therefore, we have been using a design wind velocity of 120 mph.*
>
> *"The pipelines will be subjected to no thermal expansion, as very little temperature change will occur during or prior to their use.*
>
> *"All piping will be supported by precast concrete supports, with bell bottom foundations spaced 20 ft apart.*
>
> *"The pipe load will be transmitted through guides to the supports. Pipes should be anchored firmly so that they cannot be blown off their supports. The lowest layer of pipe is to be 20 ft above the ground, with 4 ft between pipe layers.*
>
> *"We feel that the wind loading and the effect of one pipe shielding the other is critical in the design of the supports. We would like to have information that will provide a firm basis for assuming wind loads on this type of installation." — D.S.F.*

Effect of Wind Is Often Considered In Designing for Lateral Stability

INASMUCH as the general subject of secondary loadings on pipe supports is not extensively covered in the literature it may be of interest to go beyond a categorical reply to this question and consider its broader implications.

The shielding effect from the wind of one pipe behind another usually is of minor consequence with respect to other forces acting in or on a piping system. In fact, the entire effect of wind loading on pipes often is included in some general provision for lateral stability in the supports. Hence, the question should not be considered outside of context but should be given the basic engineering analysis it deserves. For this purpose it is necessary to have rather complete definition of several conditions and to weigh these conditions in recommending a solution.

Several considerations are involved in making a basic engineering analysis of such problems, among which are:

1) Will the line be located indoors or outdoors? If outdoors, what will be the degree of exposure or shelter from other structures?

2) Is the locality particularly subject to tornadoes, hurricanes, or seismic disturbances?

3) What other horizontal loadings are present, such as thrusts caused by thermal expansion of the piping?

4) By what sort of structures will the pipes be supported and how far apart will supports be spaced?

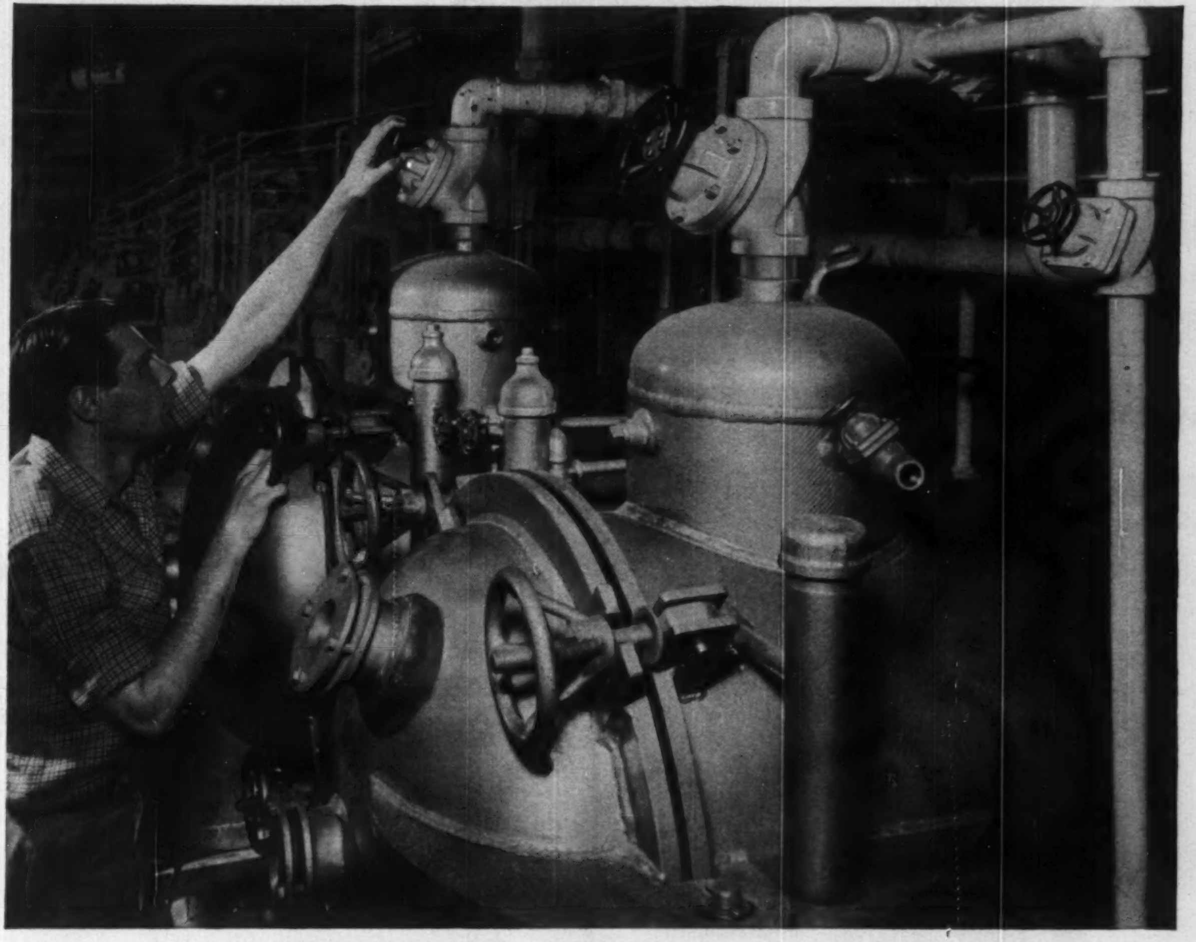
5) How will pipe loads be transmitted to the supporting structures?

A discussion of these numbered conditions follows:

1) The need for defining the degree of exposure is obvious. Sheltered piping is one thing, whereas a long run across an exposed field is something else again.

2) Designing structures to resist wind velocities of 100 to 125 mph is sufficient for many localities, whereas localities subject to frequent hurricanes or

Packless valves assure Electron Products perfect processing



Crane diaphragm valves still hold tight after 18 months on 100-micron vacuum service

Electron Products Inc., Pasadena, Calif., forms special electronic parts of metalized paper. Processing—drying, deaerating, impregnating—is done under constant vacuum.

Valves, to hold the critical vacuum within a maximum leak rate of 100 microns for a 24-hour period during processing, had to be selected with care. Obviously not any valve would do. The choice—Crane diaphragm valves for high performance value.

After 18 months, these Crane packless valves continue to hold tight on this critical vacuum service for as long as 36 hours—and on occasion, over an entire weekend.

Crane packless diaphragm valves are widely used also in processing industries where absolute tightness is necessary to prevent leakage of volatile, corrosive and hard-to-hold fluids. Complete information is available from your Crane Representative. Or write for 24-page circular.

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tornadoes require higher velocity wind design. Hurricanes may involve wind velocities up to 150 or 200 mph, whereas tornadoes are reported to have wind velocities up to 500 mph.

Just how far to go in designing against such conditions is a matter of judgment. Strength for resisting horizontal loads due to seismic shock is akin to that required for wind resistance. Where horizontal strength is provided for one of these purposes it probably can be counted on as available for the other purpose also, inasmuch as the two are not apt to occur simultaneously.

This condition is recognized in the following provision which is under consideration for inclusion in one section of the American Standard Code for Pressure Piping ASA B31.

Piping systems located in regions where earthquakes are a factor shall be designed in conformity with the best engineering practice using governmental data as a guide in determining the earthquake force. However, this force is not to be considered as acting concurrently with lateral wind force; only the one producing the more severe condition shall be used.

3) Where piping operates at temperatures producing considerable thermal expansion which is taken up by horizontal expansion loops or offsets in the line there are bound to be sidewise thrusts of considerable magnitude which have to be sustained by the supporting structures, building steel, or equivalent. With "cross-country" piping supported on structural steel bents, pipe frames, and the like, these expansion thrusts may be a controlling factor. In other words, the effect of the expansion thrusts may far outweigh the importance of any expected wind loading.

4) Where "cross-country" piping is supported overhead on high bents or pipe frames, it is customary to give them some horizontal lateral stability for resisting sidewise thrusts of any kind. This in itself may be sufficient for sustaining the expected wind loading. The spacing of supports also will affect how the piping itself will behave under different "live" loadings. Somewhat different conditions will be obtained if piping is supported close to the ground on low concrete piers or equivalent where the overturning moment is low.

5) The effect of sidewise thrusts will vary depending on whether the piping is suspended on long rods or laid directly on the supports. In either case, consideration has to be given to height of supports and how and where the piping is anchored or stayed laterally to the supports. This affects the design of both piping and supports.

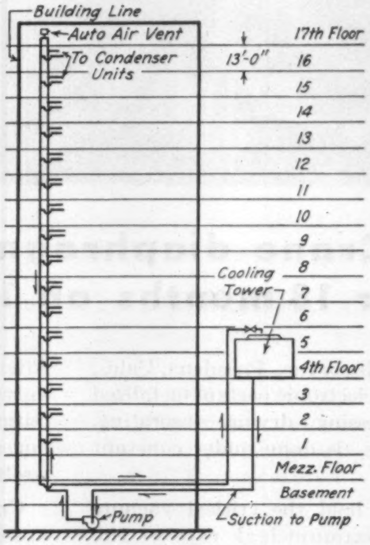
The effect of lateral wind loading may or may not be of much importance with respect to other loadings encountered. Where it is worthy of separate consideration, the effect of horizontal shielding of one pipe by another might be significant. Some precedents for estimating wind loadings under these conditions exist in structural steel design where wind loading is figured on the projected area of flat or rectangular members. For cylindrical shapes like pipes, the effective area is sometimes taken as 0.6 of the projected area. Where one member is sheltered behind another, the load on the sheltered member is sometimes taken as one-half that of the exposed member. Loads on successive members might be halved again by way of estimating their diminished resistance.

SABIN CROCKER
Mechanical Engineer
Ebasco Services, Inc.
New York, N. Y.

READER ASKS —

"What Is Pump Head for Cooling Tower Piping?"

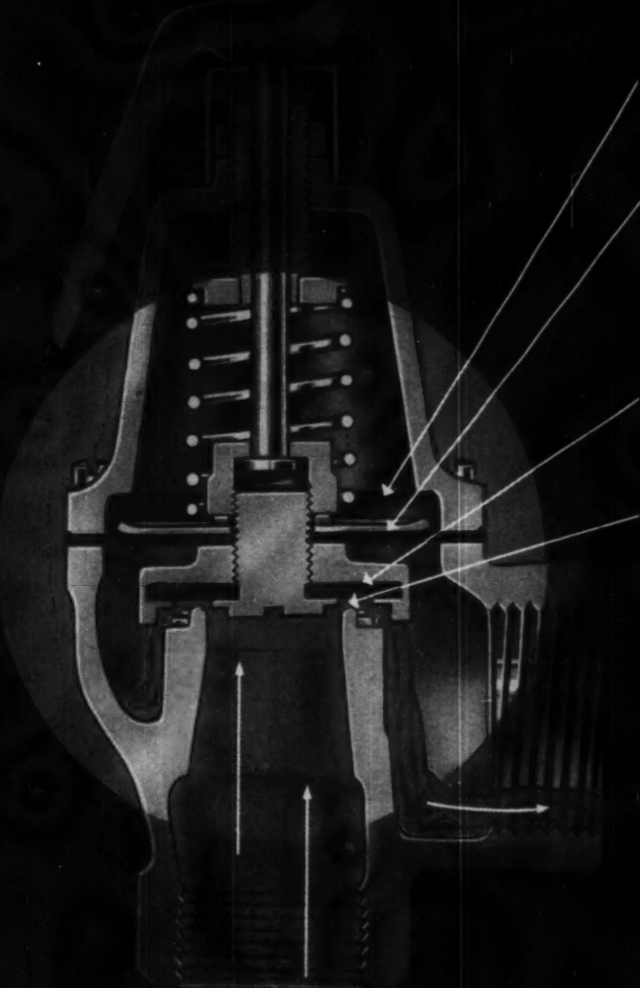
"I have a problem of accurately determining the pump head for the piping system where cooling water is pumped from a subbasement to condenser units on all of 16 stories and then to a cooling tower which has the water inlet on the fifth story level. See the drawing below.



I would appreciate any suggestions that others may have on how this problem may be solved."—J.A.W.

• *YOU ARE INVITED to contribute a question for publication or an answer to a published question. Write: The Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

WHAT DO YOU LOOK FOR IN ASME PRESSURE SAFETY RELIEF VALVES?



Double-Safe Design — No mechanical guides—not diaphragm operated.

Water Seal — Provides precise alignment of seat to disc eliminating need for hazardous mechanical guides which can stick or freeze a valve shut from lime or corrosion.

Stickage-free Disc-to-Metal Seating — heat resisting, stickage-proof silicone disc material.

Positive Pop Action — Valves operate by pressure exerted directly against **the disc** to pop valve wide open for steam relief. Operation does not depend on diaphragm, thus diaphragm rupture cannot cause valve failure.

Corrosion-Resistant — All parts constantly in contact with water are commercial bronze. Other parts are of nonferrous material. No dissimilar metals used.

ENGINEERING DESIGN

The most advanced design in A.S.M.E. rated pressure relief protection for hot water boilers is the new *Double-Safe* design of Watts Valves.

These are water pressure relief valves with an *emergency* steam rated pressure safety relief feature. They will discharge excessive water pressure created by thermal expansion and also excessive steam pressure in the event of emergency temperature conditions.

FULL SELECTION OF SIZES

Watts offers the most complete line of boiler safety relief valves with the 174A Series and 74A-740 (expanded outlet) Series. Designed to meet the smallest or largest requirements for pressure protection from one line of valves, Watts A.S.M.E. Rated Relief Valves furnish complete protection for the great majority of hot water heating and supply boilers *with a single valve.*

Watts Regulator Company · Lawrence, Massachusetts

Watts A.S.M.E. Rated Pressure Relief Valves are available in capacities from 500,000 BTU/HR to 14,370,000 BTU/HR with valve settings from 30 to 150 lbs.

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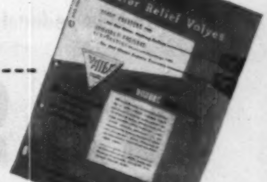
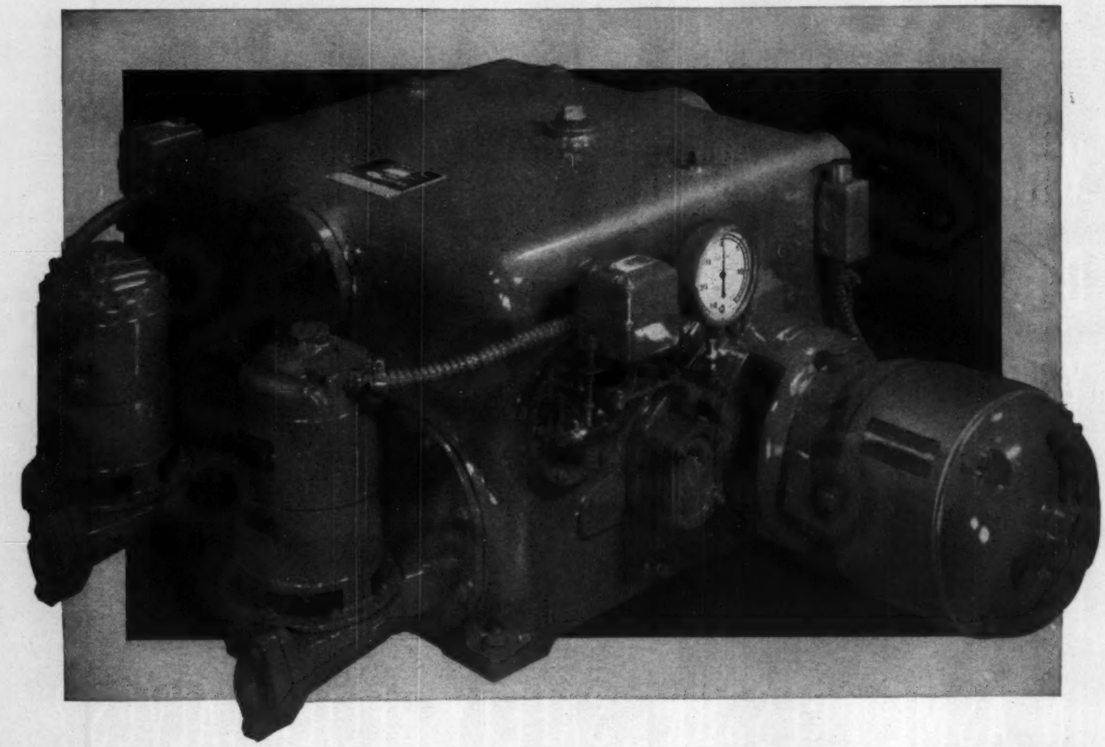
For complete Specifications,

Ratings, and Application Information on Watts A.S.M.E. Rated Valves, see your wholesaler or send for Bulletin F-ASME.



THIS NEW VACUUM HEATING PUMP IS SIZED TO ACTUAL JOB REQUIREMENTS



It's the Nash CSM

No longer is it necessary for the Engineer to accept a vacuum heating pump with air and water capacities based inflexibly upon square feet of equivalent direct radiation. With the flexible Nash CSM he can provide for proper air capacity in accordance with his judgment and experience. For the individual capacities of the separate pumps on the CSM may be varied within a wide range, without buying an oversize receiver and oversize water pumps.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low, returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- ✓ **Increased air capacity induces rapid system response without wasteful overheating.**
- ✓ **Separate air and water pumps individually selected to meet actual job requirements.**
- ✓ **Control system that operates individual pumps only when needed.**
- ✓ **Flexibility permitting addition of radiation without changing basic pump installation.**
- ✓ **Low, low, return line connection.**

NASH ENGINEERING COMPANY
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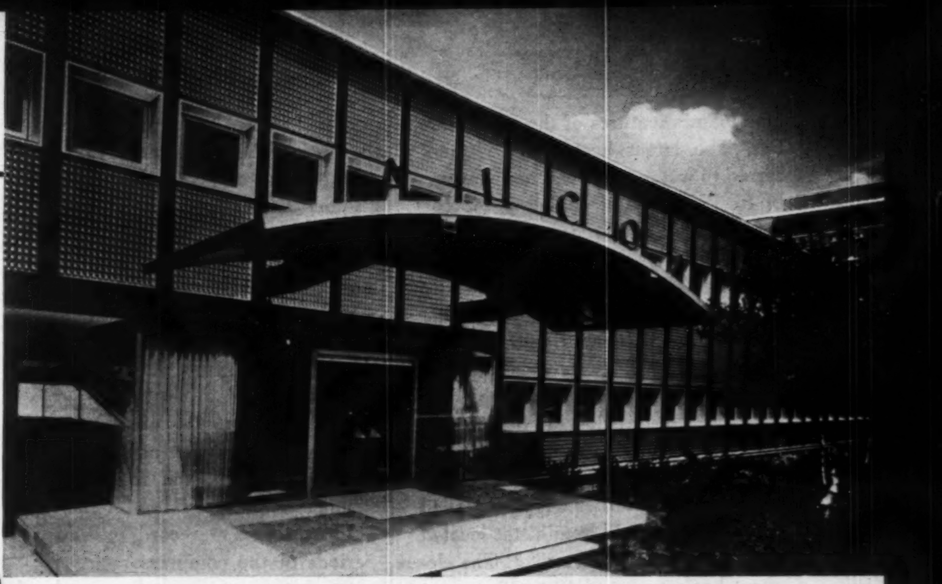
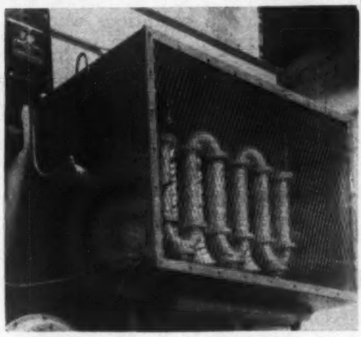




DISTRICT OFFICE job is good example of dehumidification in comfort air conditioning. Owner capitalized on low summer gas rate by installing gas reactivated type of system. Dehumidifier (below) uses activated alumina. System saved $500 in fuel costs first year

Dehumidification Serves Comfort Air Conditioning

Fundamentals of design, installation, and operation are discussed and illustrated by one installation. Performance tests show how local conditions made sorbent type dehumidification pay off.

BY THEO. F. ROCKWELL
Consulting Engineer

and

J. A. SHEAHAN
Chief Heating Engineer
Atlanta Gas Light Co.

ALUMINUM Co. of America recently completed a district office building in Atlanta. Because the local utility company offers its customers a lower rate for gas consumed during the summer months, Alcoa was afforded the opportunity to use activated alumina, a granular adsorbent, as a dehumidifying agent in the proposed air conditioning system.

Accordingly, after a conference with the architect and owner, the design of an air conditioning system using a gas reactivated dehumidifier was approved.

Using standard methods of calculation, the total cooling load, including minimum ventilation air, was determined as 48 tons. Of this, 34 tons is sensible cooling. In order to realize maximum benefit from the dehumidifier, the inside design conditions were set at 81.5 F DB and 33 percent relative humidity (50 F dewpoint) or 73 F effective temperature.

The total conditioned air is 12,100 cfm which is distributed through a medium pressure, dual duct system. Each office has its own air mixing valve and thermostat.

A stock size of dehumidifier using activated alumina was available which could remove the latent heat load by dehumidifying 5450 cfm to a dewpoint of 25.8 F. The dehumidifier requires 600 cfh of 1000 Btu per cu ft gas for reactivation. The significant air temperatures in the system are shown in Fig. 1.

A centrifugal fan type of cooling tower located in the basement machine room is used to reject heat to the atmosphere. It is equipped with two pumps, one to circulate water through the refrigerant condenser and the other to supply water to the aftercooling coil in the dehumidifier. This is one of the significant thermodynamic features of the dehumidifier. The latent heat load is transferred to water at a mean temperature of 87 F instead of chilled water (or refrigerant) at a mean temperature of 45 F.

Compressor operation is primarily controlled from a thermostat in the return air duct. Operation during the spring of 1957 established that, to satisfy all occupants, it would be necessary to start the compressor during mild weather before completely shutting down the heating system.

The dehumidifier is controlled from an electronic humidistat located in the return air thermostat. The element has a range of 42 to 48 percent RH and is adjusted for a differential of 2 percent between cut-in and cutout points.

The building was occupied February 1, 1957. All interested parties, the owner, the mechanical (heating, piping, and air conditioning) contractor, the temperature control subcontractor, and the gas company agreed to participate in a performance test of the system as soon as weather conditions would provide a suitable cooling and dehumidifying load. The period of May 15 to June 15 was selected.

In addition to the normal instruments which are part of the air conditioning system, the following instruments were provided for the test:

1) A timer to record *on* and *off* periods of the compressor

2) A timer to record *on* and *off* periods of the dehumidifier

3) A gas meter to measure the gas consumption of the dehumidifier

4) A recorder to measure room dry bulb temperature and relative humidity in the office manager's office.

As is customary at dress rehearsals, all parts of the system did not operate as intended and two weeks were consumed in completing final adjustments. The performance of the system as reported here is based on the period from June 1 to 16 inclusive. Weather data is taken from the monthly report of the Atlanta airport weather station, approximately 12 miles from the building.

Hourly readings for two significant days during this period have been selected for plotting Figs. 2 and 3. Inside design conditions were set at 81.5 F DB and 50 F WB. As frequently occurs, the building occupants insisted on operating at lower temperatures and asked that the pri-

How Do Dehumidification Processes Operate?

A ROOM which is to be comfort air conditioned in summer produces a load which has two basic components. These are, first, the sensible heat which is released within or which flows into the conditioned space and, second, the water vapor which is released within or which flows into the space.

The sensible heat load is customarily handled by circulating air at a dry bulb temperature well below that desired in the conditioned space. Likewise, the moisture problem is handled by seeing that the specific humidity of the supply air is less than that desired in the conditioned space.

At least three methods are currently available for achieving the dehumidification of the conditioned air stream:

1) Cooling (mechanical refrigeration)
2) Solid sorbents
3) Liquid sorbents.

Barring an adequate supply of naturally cold water (preferably below 50 F), the sensible cooling process and the dehumidifying process both require the expenditure of energy in substantial amounts. These processes are governed by the second law of thermodynamics; i.e., heat will not flow "uphill" unless there is an expenditure of additional energy to "pump" the heat which one desires to remove from the conditioned space.

To avoid too many ramifications, let this discussion be confined to a time when outside conditions (dry bulb and dewpoint temperatures) are definitely higher than desired inside conditions. Inside conditions which are considered comfortable would be some combination of dry bulb and dewpoint temperatures which lies within the area on the psychrometric chart bounded by the 75 and 80 F DB lines and the 55 and 58 F dewpoint lines.

The energy (sensible and latent heat) which needs to be removed from the conditioned space, together with the energy required for pumping it, must be rejected to a suitable receiver. Obviously, some thermodynamic process must be devised which will pump the sensible and latent heat out of the conditioned space and reject it to the receiver. Ideally, the result should be accomplished with the minimum expenditure of energy. Energy, however, is available in different forms as electricity, as chemical energy stored in fuels (coal, gas, oil), and as internal energy stored in steam or hot water.

The various thermodynamic processes which might be used do not have the same coefficient of performance (ratio of energy removed to energy input). Hence, careful consideration must be given to unit costs for energy. It is possible that a process with a high coefficient of performance may require energy at a price which causes a less efficient process to require a lower expenditure of money.

mary control thermostat be set between 72 and 73 F.

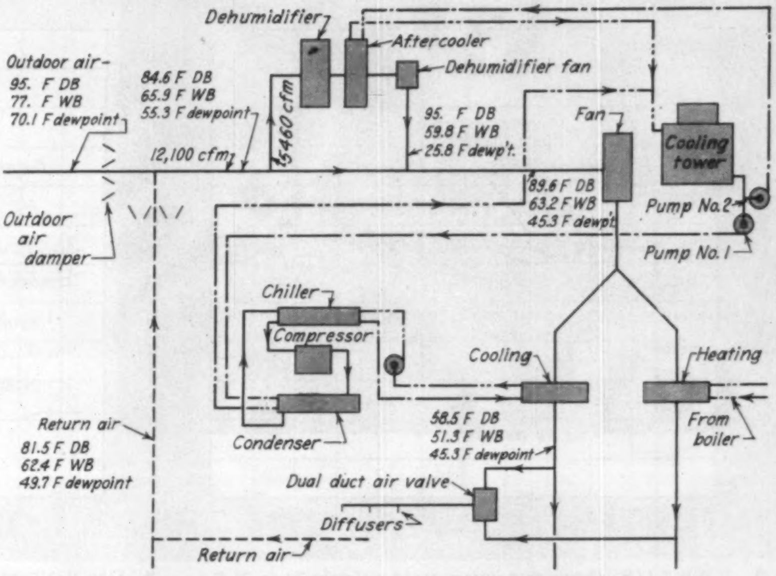
The log for June 7 shown in Fig. 2 indicates that the system could maintain these cooler conditions when the outdoor temperature was over 80 F DB and over 70 F WB with but little variation in inside dry bulb, wet bulb, and dewpoint temperatures.

On June 12 the outdoor dry bulb temperature reached 93 F and the wet bulb was 75 F or higher most of the day. The system could not maintain the conditions for which the controls were set, as shown by the steady rise of inside conditions from 6:00 a.m. to 5:00 p.m. At peak conditions, both inside dry bulb and effective temperatures were below design conditions.

The compressor and the dehumidifier ran continuously on both days.

Neither the instrumentation which was included in the contract nor that which could readily be attached for test purposes was adequate to permit accurate determination of the useful output of the condensing unit or of the dehumidifier. It is necessary to infer performance primarily from energy inputs which were measured.

Final adjustments to the dehumidifier were not made until May 29 at which time the gas input was set at 114 percent of specified input. On this basis, the dehumidifier was probably operating at a moisture removal rate of 181 lb per hr. Note this difference when checking Table 1 comparing the conventional and dehumidifier systems and also when reviewing the estimated coefficients of performance, Table 2.



1 DEHUMIDIFIER removes latent heat load by dehumidifying 5450 cfm of air to 25.8 F dewpoint. Unit requires 600 cfh of 1000 Btu per cu ft gas for reactivation. Cooling tower is equipped with two pumps, one of which supplies water to aftercooling coil in dehumidifier

TABLE 1—COMPARISON of available data on conventional and dehumidifier air conditioning systems given here. Note effect dehumidifier has on lowering total refrigeration load by removal of latent heat

	Conventional	Dehumidifier
Outside design conditions		
Dry bulb, F	95	95
Wet bulb, F	77	77
Dewpoint, F	70.1	70.1
Inside design conditions		
Dry bulb, F	78	81.5
Wet bulb, F	64	62.3
Dewpoint, F	56	50
Effective temperature, F	72	73
Calculated loads		
Refrigeration, in 1000 Btu per hr		
Sensible heat	378	402
Latent heat	162	—
Total	540	402
Dehumidification		
Water, lb per hr	—	159
Equivalent cooling, in 1000 Btu per hr	—	169
Conditioned air, cfm	13,900	12,100
Minimum outdoor air cfm	2,580	2,580

TABLE 2—ASSUMED PERFORMANCE COMPARISON between conventional system and system with dehumidifier given here

	Conventional	Dehumidifier
Input, kw		
Compressor, kw	48.0	28.9
Chilled water pump, kw	2.8	1.9
Condenser water pumps, kw		
Compressor, kw	4.0	2.6
Aftercooler, kw	—	1.9
Cooling tower fan, kw	4.4	5.3
Subtotal, kw	59.2	40.6
Subtotal, 1000 Btu per hr	202.0	138.0
Gas to Dehumidifier, 1000 Btu per hr	—	683.0
Total input, 1000 Btu per hr	202.0	821.0
Output, 1000 Btu per hr		
Cooling Coils, 1000 Btu per hr	—	402.0
Dehumidifier, 1000 Btu per hr	—	191.0
Total, 1000 Btu per hr	600.0	593.0
Coefficient of performance	2.96	0.72

Based upon the coefficients of performance derived above, the ratio for the two systems is 2.96/0.72=4.1.

Some assumptions are necessary to compare the coefficient of performance of the actual system with that of a hypothetical conventional system. These assumptions are:

1) That the existing condensing unit and dehumidifier were handling very close to design loads during the test

2) That the dehumidifier was carrying an overload of approximately 14 percent

3) That the conventional system would require a 50 hp condensing unit and this would be operated at capacity or, say, at 600,000 Btu per hr

4) That the required energy input to the components of the conventional system could be forecast from measurements made on motors of existing components and on load calculations.

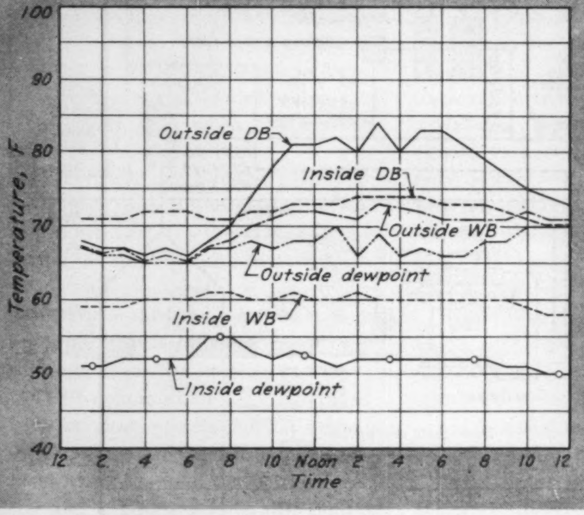
The cooling coils and condensing unit were specified for a sensible heat removal capacity of 402,000 Btu per hr. Chilled water entered cooling coils at 43 to 44 F. After final adjustment to the dehumidifier, the cooling coils remained dry, which indicates that dry air from the dehumidifier was leaving at a sufficiently low dewpoint to keep the dewpoint of mixed air entering the cooling coil below 43 F.

The electric current input to the compressor motor was 1 ampere over rating at specified conditions and the temperature drop across the chiller was 7 F deg. It is therefore presumed that the condensing unit was handling a net refrigeration load close to 402,000 Btu per hr.

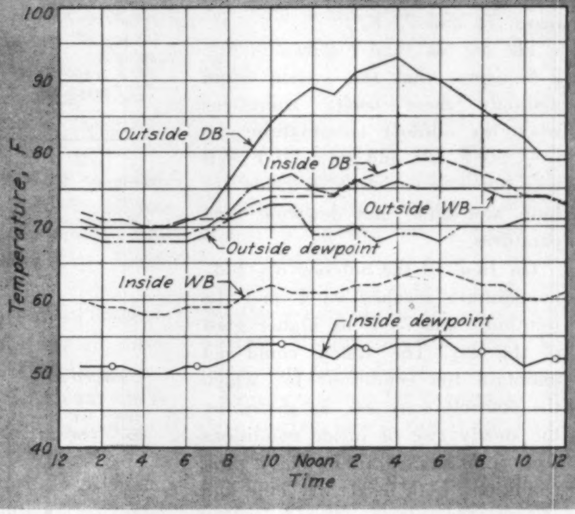
No Common Comparison Basis

A common basis for making an exact comparison of the system as designed and installed with a conventional system which might have been installed does not exist.

First, the inside design conditions used in the load calculations for the conventional system differ from those used for the design of the system with a dehumidifier. Second, a com-



2 JUNE 7 LOG shows that system could maintain 72 to 73 F DB indoors when outdoor temperature was over 80 F DB and 70 F WB with but little variation in indoor conditions. Inside design conditions were previously set at 81.5 F DB, 50 F WB



3 ON JUNE 12 outdoor dry bulb soared to 93 F, with wet bulb 75 F or higher most of the day. System could not maintain conditions for which controls were set. Data was gathered in performance testing

plete selection of equipment for the conventional system was not made when it was decided to proceed with the dehumidifier system. However, a comparison of the available data on the two systems is given in Table 1.

Realize Operating Cost Saving

Probably the question uppermost in the reader's mind is, "Was there a reduction in annual cost for energy?" The answer is yes. Analysis of electric and gas bills indicates that the combined energy costs for the first year is lower by $500.

This difference has been derived from the gas bills for the period of Oct. 1, 1956 to Oct. 1, 1957; from the electric bills for the period March 1 to Aug. 30, 1957; and from an estimate of the additional electrical energy which would be needed to do the entire job by refrigeration. Table 2, comparing coefficients of performance, indicates the additional input required for the conventional system.

Further detailed data on costs is not considered pertinent to the general purpose of this article and is omitted because the rate schedules given apply only to Atlanta, and because the dehumidifier used is intended primarily for industrial application and it has excess capacity. The contractor's estimate of the additional capital cost of the dehumidifier for this job could not be reliably applied to some other job.

Must Consider Many Factors

W. Trinks, professor emeritus of mechanical engineering, Carnegie Institute of Technology, has said many times, "An engineer is a person who begins with insufficient premises and arrives at good and logical conclusions." With this in mind, the following conclusions are offered concerning the application of sorption type dehumidifiers to comfort air conditioning:

1) The handicap of poor thermal performance can be overcome if the cost of energy in the form of fuel is sufficiently below the cost of electrical energy.

2) Sorption dehumidifiers will have to be designed specifically for comfort air conditioning. Generally, comfort air conditioning equipment has to be amortized over fewer hours per year than industrial equipment.

3) The sorption dehumidifier is an additional piece of equipment in the comfort air conditioning system.

4) Sorption dehumidifiers will appear more favorably where large quantities of condensing water are available at low cost or where additional cooling tower capacity can be provided inexpensively. The heat rejected by a solid sorbent dehumidifier system to cooling water or cooling tower is about 20 percent greater than for a conventional system.

5) A dehumidifier operating under its own control can be used to offset an unsatisfactory characteristic of a dual duct system. During intermediate seasons, when outdoor air temperatures are low enough to do the necessary sensible cooling, a building can be overhumidified. A dehumidifier can keep this under control without requiring reheat.

6) In some cases, there is a possibility of making a sorption dehumidifier more economical if the refrigeration systems have been designed to carry part of the peak latent load.

7) To arrive at a careful and reasonably accurate appraisal of the merits of one system over another, it will be necessary for the engineer to make two complete designs and receive competitive bids and make a careful analysis of the relative costs of energy. ⧧

The authors wish to thank R. A. Turner, of McKenney's, Inc., mechanical (heating, piping, and air conditioning) contractor; Schell, Deeter & Stott, architects; and E. C. Marotte, office manager, Atlanta district, Aluminum Co. of America; for their assistance in the preparation of this article.

AMERICA'S OLDEST seat of learning is heated by purchased district steam. Condensate is returned to source for credit. University expansion has made it necessary to . . .

Revise Steam Lines, Improve Metering To Keep Abreast of Heating Needs

Since 1912, when district steam was first purchased by Harvard University, three successive installations have been required to accurately measure the live steam for and the condensate from a continually growing distribution system.

BY C. M. HOLDEN
Engineer
Bailey Meter Co.

and

NORMAN GOODWIN, JR.
Dept. of Buildings and Grounds
Harvard University

WHEN Harvard University started an extensive building program back in 1912, a broad, forward looking plan was conceived which would provide steam for heating the new buildings. Under this plan the university was to receive live steam from the Harvard plant of the Boston Elevated Railway Co. and return the condensate from same for credit.

Since Harvard was to pay only for the heat used, it was necessary that provision be made for measurement of the live steam received and the condensate returned.

Several boiler meters and steam meters were already in service on a rental basis in six or seven power stations, and calibration tests had been made in Boston Edison Co. plants. Harvard insisted that the meters for measuring the condensate be of the same make as those metering the supply steam. In this way the calibration would be similar. Two steam meters and two weir meters were placed in service for the heating season of 1914-1915.

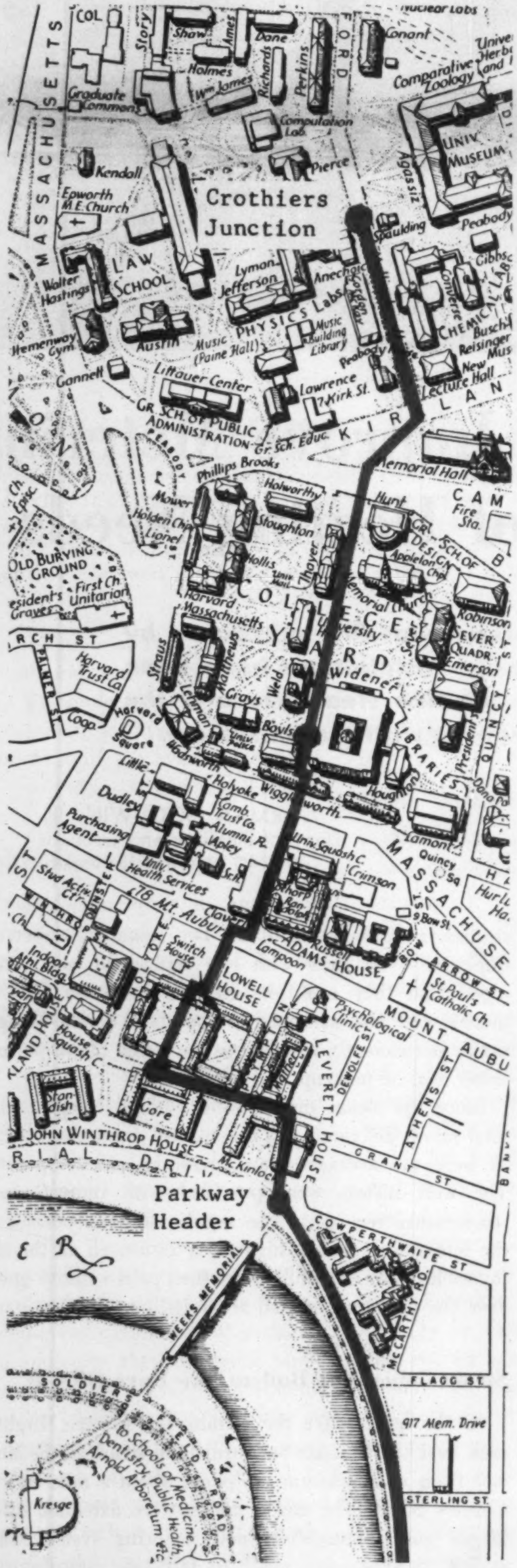
First Meters Installed in Two 6 In. Lines

A paper entitled *Method by Which Harvard Buys Steam on a Heat Unit Basis* was presented by E. G. Bailey at the eighth annual meeting of the National District Heating Association in 1916. This paper fully describes the installation of the two steam flow meters on duplicate 6 in. lines with two orifices in each, and so piped that they could be checked in series. The weir meters were also arranged to operate in series. Weighing tanks, permanently installed in the steam plant, permitted water tests on makeup feed to boilers.

Since the steam meters were without integrators, the total steam delivered was determined from chart records, as were the average steam pressures and temperatures. The weir meters were provided with integrators and temperature recorders. The regular station operator read the integrators, and a third party measured all the charts for each month. The bills were then paid without question over the operating period from 1914 to 1930.

Steam Generating Boilers Now Burn Oil-Gas

In the late 1920's the Cambridge Electric Light Co. took over the contract for furnishing steam to the university from its Blackstone St. plant, about a mile down the Charles River. The steam mains were extended and enlarged and a completely new metering system was installed. Studies were made to facilitate coordination of the electric generation with the new conditions imposed by the Harvard steam load.


Crothiers Junction
Parkway Header
MASSACHUSETTS
Nuclear Labs
COL
Story
Shaw
Ames
Dane
Conant
Holmes
Wm James
Richards
Perkins
Comparative Zoology
Graduate Commons
Computation Lab
Univ Museum
Kendall
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ADAMS HOUSE
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ARROW ST
LOWELL HOUSE
Psychological Clinic
MOUNT AUBURN
DEWOLFE ST
LEVERETT HOUSE
ATHENS ST
Standish
Gore
JOHN WINTHROP HOUSE
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How Steam Mains Are Laid Out To Heat Harvard's Buildings

The present route for steam piping at Harvard consists of two sections of an 8 × 8 ft walk-through tunnel. The first section extends about 1950 ft from the Cambridge Steam Corp. along Memorial Drive to a point opposite the Weeks Bridge called the Parkway Header. From this point branch steam mains cross over the Charles River from Cambridge into Boston to feed the Harvard Business School, the Harvard athletic department, and the department of buildings and grounds service building.

The second section extends approximately 3900 ft through the central portion of the university to a point called Crothiers Junction. Many side walk-through tunnels and conduits extend from either side of this central artery to feed the various building groups.

The system's original design comprised two 12 in. steam mains from the Cambridge Steam Corp. power house to the Parkway Header and then two 10 in. mains to Crothiers Junction. All buildings and building groups adjacent to the main steam tunnel could be supplied by either of these two steam mains.

Over a period of years the addition of dining halls, dormitories, laboratories, and lecture halls on the end of the steam distribution system caused serious problems of pressure drop and low steam capacity. Therefore in 1956 the university completed another major addition to the steam distribution system by installing a new 12 in. express steam main from the steam plant to Crothiers Junction—a distance of 5850 ft.

This steam main, with three exceptions in the first section, has no connection to individual building groups, but ties into the existing system at the Parkway Header, Widener Chamber, Mill St. Header, and Crothiers Junction. This allows the pressure characteristic at various locations along the line to be improved considerably with a minimum of operating procedure. This additional capacity is not only convenient at times of emergency shutdown of sections of the original mains, but should carry the university through many more years of growth and expansion.

Two new stoker fired boilers, 1433 hp each and operating at 420 psig, were installed along with a 2500 kw back pressure turbogenerator unit.

The boilers were hand fired until 1937, when furnace draft controllers were added. Complete combustion control was installed in 1950, when the change to oil firing took place. Off peak natural gas firing was installed and went into use about June 1955.

Completely new boiler panels with new replacement boiler meters, gas flow-air flow meters, and the necessary control equipment for automatic gas firing are being installed. Combustible oxygen recorders on each boiler are also a part of the new instrument installation.

Under normal conditions, 100 psig back pressure steam is fed directly to the system. A pressure reducing and desuperheating station stands by for emergency use between the 420 and 100 psig systems, or when the 420 psig turbine is out of service.

Second Meters Served Three Parallel Lines

Extreme variation between summer and winter loads required a flexible meter arrangement that could be adjusted to keep operation in the upper 75 percent of chart range. This was accomplished by 5, 8, and 12 in. diam lines in parallel which could be turned on and off when necessary to accommodate the load conditions.

Meters to record flow, pressure, and temperature were installed in each line. Maximum capacities were fixed at 15,000, 60,000, and 180,000 lb of steam per hr. This arrangement gave accurate results from 4000 to 250,000 lb of steam per hr, but close attention on the part of the station operators was necessary to keep the proper lines in service to give the desired results.

A single new weir meter of the same general design as those previously installed at the Boston Elevated Railway Co. was put into service to measure the returned condensate. Water temperature was recorded on the same chart with flow. The new meter was equipped with two v-notches, one 60,000 and one 240,000 lb of water per hr. By blanking the notches either capacity could be obtained. A maximum 300,000 lb per hr could be provided with both open.

The new meters were all equipped with integrators, eliminating the monthly third party measurement. The pressures and temperatures still had to be planimetered with an occasional check of the flow record, but the work could be taken over by plant personnel.

Raise Weir Capacity of Return System

The second metering system for Harvard steam continued in service without change for the 21 years between 1930 and 1951. Increased use of steam then made it necessary to step up the capacity of the weir meter of the return system. It was decided to replace the mechanical recorder with a float operated transmitter and electronic receiver which could be mounted in a more accessible location in the turbine room. The v-notches were replaced with new ones for 75,000 and 320,000 lb of water per hr, giving a potential maximum capacity of 395,000 lb per hr.

At the same time, a new 80,000 lb per hr boiler unit was added to meet the increased Harvard demand and serve other customers of the newly formed Cambridge Steam Corp.

Increase Pipe Line Capacity, Meter Range

Harvard's continuing building program made it necessary in 1953 to provide more pipe line capacity and change the metering system. George Gowdy, chief engineer for the New England Gas & Electric Association, contributed considerably in developing the metering system that is now installed on a revised feeder system.

Plans for further expansion at Harvard within the next few ensuing years made it necessary to develop a metering system that would take care of increased requirements in the future. It was also desirable to obtain wide range accuracy with less attention on the part of the operators. These requirements led to replacement of the previous three parallel steam lines by 10 and 14 in. diam lines. Ultimate demand in cold weather of 300,000 lb of steam per hr had to be provided for, with summer demands becoming as low as 7000 lb per hr.

The problem was finally solved by installing a 10 in. two-position automatic adjustable orifice of 30,000 and 100,000 lb of steam per hr capacity on the low and high range positions, respectively. A fixed range meter was installed in the 14 in. line having a maximum capacity of 225,000 lb of steam per hr.

It was necessary to install straightening vanes in both lines because of the limited space for the larger lines. This arrangement in the 10 in. line gives automatic wide range of metering between 7000 and 100,000 lb of steam per hr and will take care of the system during all weather except the cold winter months. An overall range from 7000 to 325,000 lb of steam per hr is provided with shifting only between two lines. A signal light is provided to warn operators of the approach of maximum high range on the 10 in. meter. Similarly, another signal light warns the operators when the 14 in. meter is decreasing close to the 25 percent point.

Wide Range Metering at Its Best

The new meters give records of steam pressure and temperature, the latter using an electronic element. The 10 in. wide range meter is equipped with high and low range integrators, one of which is always cut in with the corresponding capacity setting of the automatic adjustable orifice. The panel truly shows wide range metering at its best.

Steam demand figures for one day now go as high as 4.9 million lb in cold weather. In at least one instance it has been necessary to boil as much as 118 tons of water and send it to the steam lines to the college buildings to keep the Harvard men warm for 1 hr. ⧧

WHEN PLANNING A MAINTENANCE PIPE WELDING JOB —

Ask Yourself These Questions:

- ***what is the base metal to be welded?***
- ***does the thickness of the pipe present any problem?***
- ***what welding process should be used?***
- ***what size and type of electrode or filler metal should be used?***
- ***what welding procedure is to be used?***
- ***who is going to do the job?***

BY RAY M. KOLB
Head Foreman, Welding Shop
Standard Oil Co. (Ind.)

WHEN A MAINTENANCE pipe welding job arises there are some fundamental questions that should be answered to be sure of a successful welding job.

Consideration should be given to the material to be welded and the effect, if any, that the pipe thickness may have on the welding process. Careful evaluation should be made of the various welding techniques available, and the selection of the electrode should be made with equal caution. Another major decision is that of selecting the right welder to do the job.

What Is Base Metal to Be Welded?

It pays big dividends to keep accurate records of the piping materials that may someday require welding. These records can best be obtained at the time the installation is made. One must be careful, however, to avoid ambiguous descriptions such as "stainless steel," "brass," "aluminum," or "alloy steel." Many different types fall into each of these broad classifications. Practically all of these metals can be welded effectively if their individual compositions are known, but considerable difficulty can result from guesswork.

To get an accurate metal identification would require a spectrographic or quantitative chemical analysis. Such analyses are expensive and it is usually impractical to wait for such to be made. There are a few simple tests, however, that can give some idea of metal composition.

Spark Testing is One Method

Spark testing can often be helpful. Iron base or ferrous materials throw off a characteristic spark stream when held against a grinding wheel, while the nonferrous materials such as copper, aluminum, and nickel base do not yield any appreciable spark. Testing is best done in a shaded area where the color of the spark stream can be easily seen. A medium or small grained grinding wheel turning at ordinary operating speeds produces a satisfactory spark. Best results are usually attained by comparing the spark from the unknown material with known samples. Care must be taken to use the same speed and contact pressure since the length of the stream will vary if either is changed.

Welding rod is a source of sample material, but care must be taken in using coated electrodes as a comparison metal since alloying agents are frequently added through the coating. Spark testing charts are included in most handbooks and steel suppliers' catalogs.

Magnetic Qualities Also Helpful

A magnet helps in identification, by separating materials into three groups, as follows:

Group I—Strongly magnetic
  1) Carbon and low alloy steels
  2) Wrought iron
  3) Cast iron
  4) Pure nickel
  5) Stainless irons (under 17 percent chrome)

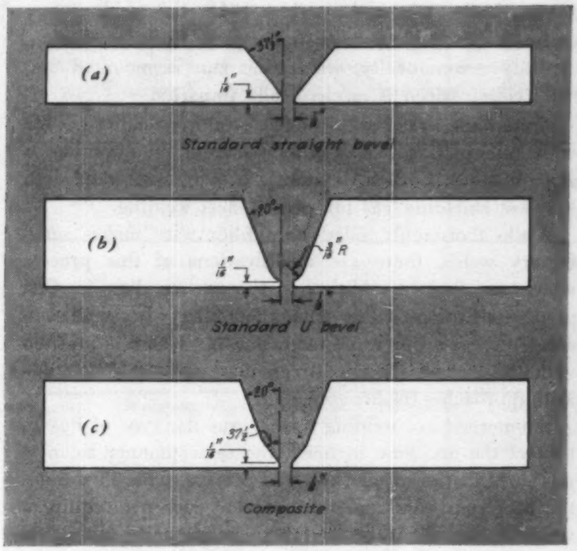
Group II—Slightly magnetic
  1) Stainless steel (18-8 types when cold worked)
  2) Monel
  3) High nickel alloys

Group III—Nonmagnetic
  1) Stainless steel (18-8 type annealed)
  2) Copper base alloys
  3) Aluminum base alloys
  4) Zinc base alloys

The magnet test has special significance with stainless steel identification since the nonmagnetic or slightly magnetic materials require no preheat nor stress relieving, while those that are magnetic do.

A nitric acid spot test is another way to get some idea

This article is adapted from a paper presented at the ninth Plant Maintenance & Engineering Show, Chicago, January 27-30, 1958.



1 **PIPE less than ¾ in. thick is usually welded using bevel *a*. For greater thickness, standard U bevel *b* is designed to reduce welding time. Compromise, *c*, solves problem of burn-through at root when arc welding**

of composition. A drop will not affect stainless steel nor stainless iron but will produce a green or blue-green color with monel or copper nickel and a brown color with low carbon steel.

Chisel testing is frequently used to determine if a part is made of gray cast iron, malleable iron, or steel. This identification can readily be made with a sharp edged chisel and a hammer. By trying to cut a continuous chip (not over 1/16 in. thick) it can be determined which of these metals is involved. With cast iron it is not possible to obtain a continuous chip. With malleable iron a short, slightly curved chip about ½ in. long is obtained. However, if the piece tested is steel, a continuous curled chip over ½ in. long can be obtained.

Joint Type Varies with Wall Thickness

As a general rule, the type of joint most desired is the one that will permit satisfactory welding at a minimum cost. Pipe under ¾ in. in thickness is usually welded with the type of bevel shown in Fig. 1a. It consists of a 60 or 75 deg included angle and a ⅛ in. land. This joint is simple to prepare, either by flame cutting or machining.

Where thicknesses are greater than ¾ in., the joint becomes much wider than is needed for accessibility and it requires considerable time to weld. To reduce welding time on heavier walled pipe, the type of joint design shown in Fig. 1b is used. The thin section at the root of this joint will give some difficulty with burn-through when arc welding.

This difficulty is not encountered when using the joint shown in Fig. 1a and has led to the compromise shown in Fig. 1c, which is very popular for heavy walled pipe welding.

In chipping or gouging out cracks to be repair welded by electric welding, care must be exercised to get a proper sized groove. It must provide accessibility, but if it is too big, not only is more welding time required, but also the possibility of cracking and/or distortion is increased. A sheet metal template made to the contour of the groove shown in Fig. 1b is a handy guide in providing a proper joint for this type of work.

Which Welding Process Should Be Used?

Manual electric arc welding with coated electrodes, and oxyacetylene welding are the two most widely used processes in maintenance.

Tungsten inert gas welding has been the key to the successful solution of many difficult maintenance welding problems. In some ways this process can be considered a combination of electric arc and gas welding. The heat source comes from an electric arc maintained between a tungsten electrode (which is practically nonconsumable) and the work.

Fig. 2 shows how this tungsten electrode is mounted in a torch which the welder manipulates with one hand while he adds filler metal with the other, using a technique similar to oxyacetylene welding. Inert gas (argon or helium) is directed by a concentric nozzle around the tungsten electrode so that it protects the electrode, the arc stream, and the molten weld pool from the harmful effects of nitrogen or oxygen in the air.

This process has been very effective in welding aluminum, magnesium, light gage sheet steel, and in putting high quality root passes in critical piping.

Metal inert gas welding utilizes inert gas to protect the arc zone in the same manner as in tungsten inert gas welding. However, the arc itself is maintained directly between the filler metal and the work. Automatic controls feed the filler metal from a coil at such a rate as to give proper welding conditions.

Metal inert gas welding may be used either semiautomatically, where the welder holds the welding gun in his hand and manually imparts the forward motion, or fully automatically, where the gun is mounted and the welding speed is mechanically imparted.

Aluminum, brass, and stainless steel are readily welded with this process, using either helium or argon as a shielding gas. Carbon dioxide is proving successful as a low cost shielding gas for carbon steel welding.

While thoroughly filled bare filler wire makes satisfactory welds, there are modifications of this process which use flux in addition to the carbon dioxide. One process utilizes a hollow flux filled filler wire, while another utilizes a powdered magnetic flux which is injected with the carbon dioxide stream and coats the electrode as it approaches the arc zone.

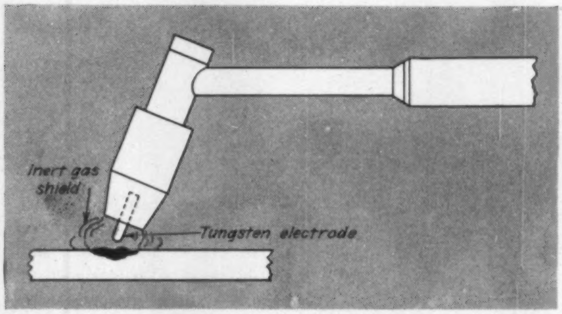
Submerged arc welding uses a granular type of flux to protect the arc zone in much the same manner as inert gas does in the metal inert gas process. This flux hides the arc from view and the operator does not require a welding helmet. It is used both semi- and fully automatically. The granular flux melts from the heat of welding and leaves the weld covered with a glasslike coating which is readily removed. This process is limited to welding in positions where the granular flux remains in place due to gravity alone or where suitable dams can be built to retain it. It has found extensive use in pressure vessel fabrication and repair and has found economical use in fabricating pipe as small as 6 in. nominal pipe size. It can be used on low and medium carbon steels and on most alloy and stainless steels.

What Size, Type of Electrode Should Be Used?

It is confusing to select from the many types of coated mild steel electrodes available for electric arc welding. The American Welding Society identifies this group as E60XX; E means arc welding electrode, and 60 represents 60,000 psi minimum tensile strength of as-deposited weld metal. The third digit shown only as X designates the positions in which the electrode is suitable to weld. The fourth digit tells the power supply required, penetration, type of arc, and weld quality.

Table 1a gives the interpretation of the third digit, while Table 1b gives the meaning of the fourth. There are 13 coated mild steel electrodes carrying AWS classifications. They are E6010-11-12-13-14-15-16-18-20-24-27-28 and 30.

E6010 electrodes are for use with direct current and reverse polarity only. They are excellent for pipe welding. The thickness of the coating is held at a minimum to aid in welding in the vertical and overhead positions. The arc is forceful and deeply penetrating. E6010 electrodes — with their deep penetration, cleaning slag, and voluminous gas shield — usually dig through and produce a satisfactory weld.



2 TUNGSTEN INERT GAS WELDING is accomplished using tungsten electrode mounted in torch which welder manipulates in one hand while he adds filler metal with other. Inert gas shield protects electrode from nitrogen, oxygen

E6011 electrodes are for use with alternating current, as well as direct current, reverse polarity. With a-c they are comparable in performance to the E6010 electrodes, but some sacrifice in usability characteristics will be observed when E6011 electrodes are used with d-c, reverse polarity.

E6012 electrodes are intended for welding where deep penetration is not desirable. They burn with a quiet, stable arc, produce little spatter, and completely cover the weld with a dense but easily removable slag deposit. The E6012 electrode is often referred to as a "poor fitup electrode" due to its ability to bridge gaps in irregular joints. It operates best with d-c, straight polarity, but can be used with a-c.

E6024 electrodes are iron powder modifications of the E6012 types. Their deposition rate for comparable sizes is approximately twice as great and their ease of handling and excellent appearance bring good operator acceptance.

E6013 electrodes are available in two modifications. One variety is an excellent all-position sheet metal electrode. The second is used on heavier applications such as field erected storage tanks. These electrodes are easy to use, having little tendency to undercut, practically no spatter, and excellent weld appearance.

E6014 electrodes are iron powder modifications of the E6013 electrodes. They have a higher deposition rate, even easier slag removal, and excellent weld appearance.

E6015 and E6016 electrodes are known as low hydrogen electrodes. The E6015 is a d-c, reverse polarity type while the E6016 is its a-c counterpart. Experience has shown that the performance of the E6016 electrode on d-c, reverse polarity, is entirely satisfactory and, consequently, E6015 electrodes are dropping out.

High sulfur steels are best welded with low hydrogen electrodes. Care must be taken with these or they will pick up atmospheric moisture. Once the container is opened the electrodes can pick up sufficient moisture in several hours to cause detrimental results.

There are two solutions to the problem. One is to buy the electrodes in small containers so that once opened they are quickly used. The other is to keep them in a heated oven after the container is opened. If an electrode does pick up moisture it can be dried out by baking at 600 to 700 F for several hours.

E6018 electrodes are iron powder varieties of the

E6016 electrodes. They give higher deposition rates with the same high quality.

E6020 and E6030 electrodes are commonly referred to by welders as "hot rods." The E6020 electrodes are used for horizontal fillet welds and for flat position groove and fillet welds. The E6030 electrodes have a somewhat higher deposition rate than the E6020.

The E6027 electrode is an iron powder modification of the E6020, while the E6028 is an iron powder low hydrogen type primarily for downhand welding.

Welding rods available for acetylene welding of mild steel are listed in Table 2. The letter G designates them as gas welding rods. The two numbers shown give the tensile strength in 1000 psi. A second letter A or B refers to the degree of elongation. Grade A has a slightly higher elongation than B.

The American Welding Society electrode designation system also applies to the low alloy materials. However, since the tensile strength of some of these materials is higher than 100,000 psi it may require the first three digits to designate it. For example, an E12016 would be a low hydrogen type of electrode with a 120,000 psi tensile strength.

In low alloy type electrodes it is usually essential to know the chemical composition so that the base metal chemistry can be matched. Table 3 shows the designations to cover chemical analysis of electrodes. While a complete classification number for mechanical properties alone would be E7010, a classification to include also chemical analysis would be E7010-A1.

The low hydrogen type electrodes are very effective in welding materials of this type where under-bead cracking could be a major source of trouble. Table 4 lists the preheat, interpass, and stress relieving temperatures usually employed.

Table 5 lists the many different types of stainless steel filler metals and their compositions. This list shows how inadequate it is merely to describe a metal as stainless steel. This tabulation not only includes the coated electrodes for arc welding, but also includes the bare wires for acetylene, submerged arc, or inert gas welding.

The prefix E refers to metal arc electrodes, while the prefix ER designates a bare wire that could be used as an electrode for either the submerged arc or metal inert gas process or as a rod for acetylene or tungsten inert gas welding.

The number following E or ER is the AISI stainless steel type number. The suffixes ELC and L both signify extra low carbon content. Two other suffixes, Mo and Cb, represent the addition of molybdenum and columbium, respectively.

The coated electrodes use much the same designation system as for mild steel electrodes except that the AISI number is substituted for the digits representing tensile strength. For example, in an E310-15 electrode, the E means that it is an electrode, the 310 says it is an AISI type 310 stainless steel, and the 1 and 5 have the same meaning as given in Tables 1a and 1b.

The type 308 filler metals are used to weld the 18-8

TABLE 1a — MILD STEEL ELECTRODES for electric arc welding are identified by American Welding Society as group E60XX. E means arc welding electrode; 60 represents 60,000 psi tensile strength. Third digit, X, designates positions in which electrode is suitable to weld, as given here

Third digit	Positions of welding in which satisfactory welds can be produced
1	Flat, vertical, horizontal, and overhead
2	Flat and horizontal fillets
3	Flat only

TABLE 1b — FOURTH DIGIT of electrode classification, E60XX, tells power supply required, type of arc, penetration, weld quality

Fourth digit	Power supply	Type of arc	Penetration	Quality
0	d-c, Rev. Pol.[a]	Digging	Deep[b]	High
1	a-c or d-c, Rev. Pol.	Digging	Deep	High
2	a-c or d-c	Medium	Medium	Moderate
3	a-c or d-c	Soft	Light	Moderate
4	a-c or d-c	Soft	Light	Moderate
5	d-c, Rev. Pol.	Medium	Medium	High
6	a-c or d-c, Rev. Pol.	Medium	Medium	High
7	a-c or d-c	Medium	Medium	High
8	a-d or d-c	Medium	Medium	High

[a] E6020 or E6030 can also use a-c or d-c, straight polority.
[b] E6020 medium penetration; E6030, light penetration.

TABLE 2 — WELDING RODS suitable for acetylene welding of mild steel come under six classification numbers. G means it is gas welding rod; A or B refers to degree of elongation

Welding rod classification number	Plate thickness, in.	Treatment of welds[a]	Tensile strength, psi	Minimum elongation in 2 in., in percent
GA65	¾	SR	65,000	20
		NSR	72,000	17
GA60	¾	SR	60,000	25
		NSR	62,000	20
GA50	¾	SR	50,000	28
		NSR	52,000	23
GB65	¾	SR	65,000	18
		NSR	72,000	15
GB60	¾	SR	60,000	20
		NSR	62,000	15
GB45	⅜	NSR	45,000	..

[a] SR designates stress relieved; NSR designates not stress relieved.

TABLE 3 — CHEMICAL ANALYSIS of low alloy steel electrodes is identified by percentages of carbon, molybdenum, chrome, nickel included in base metal chemistry

Suffix	Carbon, percent	Molybdenum, percent	Chrome, percent	Nickel, percent
A1	0.10	0.45 to 0.65		
B1	0.10	0.40 to 0.65	0.40 to 0.65	
B2	0.10	0.40 to 0.65	1.00 to 1.50	
B3	0.12	0.90 to 1.20	2.00 to 2.50	
C1	0.12			2.00 to 2.75
C2	0.10			3.00 to 3.75

TABLE 4 — PREHEAT, interpass, stress relief temperatures for welding low alloys, according to AWS classification number, given here

AWS classification number	Preheat and interpass temperatures	Stress relief temperatures
E70XX	200 - 225	1150 ± 25
EXX15	200 - 225	1150 ± 25
EXX16	200 - 225	1150 ± 25
EXX10	325 - 375	1150 ± 25
EXX11	325 - 375	1150 ± 25
EXX13	325 - 375	1150 ± 25
EXXXX-B3	325 - 375	1350 ± 25

TABLE 5 — SIMPLIFIED LIST of chemical compositions of stainless steel filler metals shows how inadequate it is merely to describe a metal as stainless steel. Prefix E refers to metal arc electrodes, while ER designates bare wire which could be used as electrode for submerged arc or metal inert gas process or as rod for acetylene or tungsten inert gas welding

AWS-ASTM classification number	Carbon, percent	Chromium, percent	Nickel, percent	Molybdenum, percent	Columbium tantalum, percent
E308, ER308	0.08 max.	19	9	-	-
E308 ELC, ER308 L	0.04 max.	19	9	-	-
E309, ER309	0.15 max.	25	12	-	-
E309 Cb	0.12	25	12	-	0.7-1.0
E309 Mo	0.12	25	12	2-3	-
E310, ER310	0.20 max.	25	20	-	-
E310 Cb	0.12	25	20	-	0.7-1.0
E310 Mo	0.12	25	20	2-3	-
E312	0.15	29	9	-	-
E316, ER316	0.08 max.	18	12	2-2.5	-
E316 ELC, ER316 L	0.04 max.	18	12	2-2.5	-
E317, ER317	0.08	18	12	3-4	-
E318	0.08	18	12	2-2.5	6 X C min. to 1.00 max.
E330, ER330	0.25 max.	15	34	-	-
E347, ER347	0.08	20[a]	12	-	8 X C min. to 1.00 max.
E410, ER410	0.12 max.	12	-	-	-
ER420	0.25-0.40	12	-	-	-
E430, ER430	0.10 max.	16	-	-	-
E502	0.10 max.	5	-	0.45-0.65	-

[a] Chromium shall be 1.9 X Ni, min., when so specified.

grades of stainless steel (AISI Types 301, 302, 302B, 304, 305, and 308). There is little difficulty in welding these materials. Type 303 is the free machining grade of 18-8 and it gives more welding trouble since the addition of sulfur or selenium tends to evolve gas.

Carbide precipitation at the grain boundaries tends to occur when many stainless steels of the 300 series are exposed to temperatures in the range of 900 to 1500 F. This results in impaired corrosion resistance. Carbide precipitation is resisted by keeping the carbon content low or by adding columbium which combines with the carbon. Proper annealing can restore the original corrosion resistance if it is practical to do so.

Types E309 and E310 electrodes join metal of their own composition without difficulty. However, they are both widely used to join dissimilar materials. An example would be joining type 308 stainless to mild steel. These electrodes have both been very successful in welding hardenable steels without cracking. However, there can be little doubt that the heat affected zone is extremely hard when this is done. Types E309 and E310 have been used to attach type 405 and type 410 strip liners to refinery vessels without preheat or stress relief.

Types 410 and 420 stainless steels present problems because of their air hardening tendencies. Both preheating and stress relieving are essential to achieve sound welds and serviceable ductility.

Type E502 finds wide use in refinery piping systems. It is also air hardening and requires preheating and stress relieving.

Light gage materials under 1/16 in. thick are best welded with the tungsten inert gas process. Metal inert gas, however, is much faster than tungsten inert gas for thicknesses over 1/8 in. Submerged arc welding gives excellent results on stainless and is probably the most economical process where applicable.

What Welding Procedure Should Be Used?

It is well to set up welding procedures on all jobs. The factors known to give a good welding job, by past performance or by testing, should be given to the welder rather than leaving such decisions to him. In fact, in much code work, such as vessel or piping fabrication, the process must be qualified. Some of the factors that should be listed are the amount of preheat, the required interpass temperature, what kind and size of electrode to use, the current setting, and the stress relieving.

One item that is extremely important in maintenance welding is that the parts to be welded be cleaned as much as possible. Rust and foreign materials can cause considerable difficulty.

Who Is Going to Do the Job?

Even after the best analysis and planning are put into a job, the final results depend upon the skill of the welder who performs the work. It is essential to know exactly what each welder can do, so that his ability can be matched against the difficulty of the job.

Some jobs are easy and can be handled by relatively inexperienced welders, while others are difficult and should be done by experts. For example, it is easy to make fillet welds in the flat position using an E6024 iron powder contact electrode, but it requires considerable skill to make x-ray quality welds in low alloy piping, using an E-7016-B3 electrode.

In many instances, welding must be done in accordance with codes, such as the American Standard Code for Pressure Piping and the American Society of Mechanical Engineers Boiler and Pressure Vessel Code. For such work it is essential to use welders qualified in accordance with the code requirements. ╪

WHY STEAM COILS FREEZE

. . . and how to combat this problem

The problem of steam coil freezing can be solved only through proper selection, sizing, and arrangement of equipment, and by providing necessary safeguards against failure of components. Some of the specific steps that can be taken to combat freezing were discussed in the April issue. Another important consideration is the design of the supply and return piping, including making sure that traps are sized to handle the maximum condensate that can accumulate, providing vacuum breakers to facilitate condensate removal, designing for rapid and equal steam distribution at adequate pressure, and including extra safety controls where they are justified.

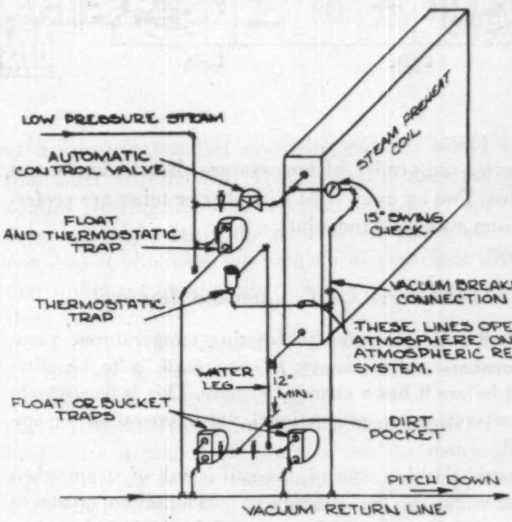
BY H. W. ALYEA
Chief Field Engineer
Johnson Service Co.

A VERY important consideration in protecting steam coils from freezing is the supply and return piping including control valves, traps, and other accessories. Many installations work satisfactorily in spite of poor piping, but a number of points are extremely important where subfreezing air is being handled if there is to be reasonable insurance against freezing.

The designer should assume that the coil manufacturer's instructions are *minimum* requirements. He should be sure that the installer is competent or that adequate supervision of the installation is provided. He should also be sure that the operating personnel understands the functioning of the system and how to maintain it in good working condition.

It is probably true, as has often been stated, that a modern nonfreeze or distributing tube coil will not freeze so long as it gets full steam pressure and so long as condensate and gases are all carried away rapidly.

While the coil is in use, full steam pressure is assured by two-position valve operation if there is no failure nor partial failure of the steam supply pressure. If proportional control of the valve is employed, full steam pressure cannot always exist in the coil since the valve accomplishes its control by reducing the pressure. For this reason, extra precautions regarding other factors should be taken.



8 SUGGESTED PIPING for preheat coil on vacuum return system includes vacuum breaker connection and air eliminating bypass around condensate traps. On atmospheric return systems, connection to return line can be omitted. (Figs. 1 through 7 were in the April issue)

Size Traps to Handle Maximum Condensate

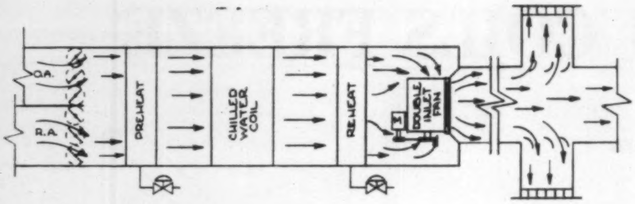
A separate trap should be employed for each coil. The return piping must be run the full size of the coil outlet to the trap because this line carries not only the condensate but also the gases which may include uncondensed water vapors.

In an unheated coil the initial condensate rate is very great. Therefore the trap should be of adequate size to handle this high condensate rate. Otherwise, a sump must be provided to hold the excess condensate while the condensing rate is higher than the trap flow rate.

Coil manufacturers' installation diagrams usually show a 12 in. drop in the line between the coil and the trap. This is partly to produce a pressure head on the trap, which increases its flow rate, and partly to create a sump for holding excess condensate. Increasing this height to 18 in. or even higher and making the volume large enough to contain any possible accumulation of condensate are valuable safety factors.

Two traps operating in parallel, each of sufficient capacity to carry the condensate, are justifiable when the cost of replacing frozen coils would be great.

Coils with extremely long tubes are less capable of



9 CENTRAL FAN SYSTEM arrangement (left) is bad since it causes stratification. Outdoor and recirculated air are introduced in two parallel streams which are poorly mixed. Condition causes unequal heat distribution throughout building, promotes coil freezing

producing uniformity of temperature distribution across the face. Two or more coils with shorter tubes are preferable from a safety standpoint.

Vacuum Breakers Aid Condensate Removal

On all coils subjected to freezing temperatures, vacuum breakers are necessary if condensate is to be eliminated before it has a chance to freeze. This is true whether two-position or proportional valve operation is employed.

For two-position control, the coil is full of steam when the valve closes. The subsequent condensation creates a vacuum in the coil which may well be higher than that in the return line. This is true even on high vacuum return systems. The trap opens but the condensate cannot escape until the absolute pressure in the coil, plus the head of water above the trap, is greater than the absolute pressure in the return. There will be gases below the head of water but it is difficult for them to work up through the condensate to equalize these pressures. Condensate is eliminated very slowly and in some cases remains in the coil until the valve again opens and applies pressure to the coil.

Proportional valves gradually reduce the pressure in the coil as they are throttled. When this pressure becomes less than that in the return, condensate elimination becomes sluggish or ceases altogether.

A type of vacuum breaker commonly used on atmospheric return systems consists of a check valve which admits room air into the coil whenever the coil pressure is below atmospheric, at the same time preventing the escape of steam. This should be a 15 deg swing check, rather than a 45 deg swing check or vertical lift check, for minimum operating differential. On vacuum return systems a bypass connection is installed between the coil and the discharge side of the trap. This contains a check valve to prevent the escape of steam but to permit air to flow from the return line into the coil. This connection to the coil should always be near the top but, since most coils do not have tappings suitable for this purpose, it can be made into the supply pipe between the automatic control valve and the coil.

Design for Rapid, Equal Steam Distribution

To provide rapid and equal distribution of steam throughout the coil when steam is admitted, the air must be eliminated promptly. Combination float and thermostatic traps permit the escape of air through the trap. However, a better arrangement is to install a separate thermostatic trap in a connection between the return line and the top of the water leg. This provides more rapid air elimination because the thermostatic trap can be of adequate size and because the air does not have to follow the water through the water leg and the condensate traps.

Fig. 8 shows suggested piping for a preheat coil on a vacuum return system, including a vacuum breaker connection and an air eliminating bypass around the condensate traps. On atmospheric return systems the connection to the return line can be omitted.

Provisions for vacuum breaking and rapid air elimination not only provide added safeguards against freezing but improve control as well. Hence, they should be included on any modulated coil, whether subjected to freezing temperature or not.

Occasionally the traps themselves are indiscriminately placed where the air is cold enough to freeze the condensate in the trap, thus causing the coils to freeze because the condensate cannot escape.

Adequate Steam Pressure Necessary

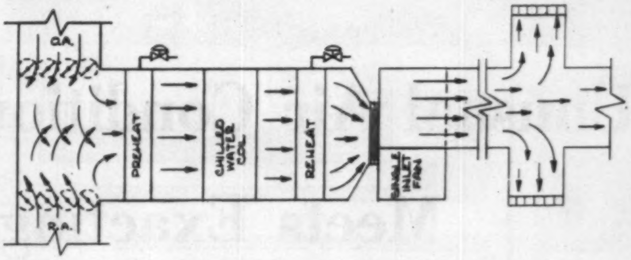
In every case it is essential to have steam pressures controlled as closely as possible. For best results, control valves should be sized for the maximum required capacity using a fairly large pressure drop. Since valve capacity varies roughly with the square root of the pressure drop, any reduction in the steam supply pressure may cause the valve to be undersized, and thus cause freezing. Such reduced steam pressure could occur, for example, during morning warmup when the condensing rate of the system may exceed the generating capacity of the boiler.

Where steam boilers are operated on and off by a two-position pressure controller, a pressure reducing valve should be installed in the supply main to assure a constant supply pressure. Even when freezing is not a problem, this constant steam supply pressure is justified because it aids greatly in obtaining smooth control of all steam consuming apparatuses.

Added Safety Controls Good Investment

No matter how carefully a system is designed, it is important that extra safety controls be used when prevention of damage can justify them. A steam pressure

10 SOME IMPROVEMENTS over system in Fig. 9 are shown here. Note that outdoor and recirculated air are introduced at opposite sides of mixing chamber. Greater weight of cold air helps to reduce stratification if introduced at top of mixing chamber rather than at side or bottom



switch, wired to stop the fan and close the outdoor air dampers in the event steam pressure falls too low, is an inexpensive and desirable device. But there are other causes of freezing, including the failure of control instruments. A thermostat or a series of thermostats located where the air is likely to be too cold can also be used to stop the fan. An averaging bulb instrument is not the proper one for this application.

The coldest point in the air stream may vary from place to place, depending upon the position of damper blades as outdoor and recirculated air quantities are varied, or upon variations in steam distribution within the coil. It may be necessary therefore to install not just one but two or more thermostats to be sure that the various possible cold points are protected.

When a fan is stopped, all of its outdoor air dampers, both maximum and minimum, should automatically close. This stops gravity flow but it does not necessarily protect the preheat coils. If the dampers are close to the outdoor air and the coils are close to the dampers, the coil can become very cold because of radiation to the dampers and other surrounding surfaces, and through damper leakage. A preheat control thermostat located near the coil will admit enough steam to keep the coil and surrounding area warm. If it is located at a distance downstream where the ambient temperature is higher this additional protection is not obtained. Valves for preheat coils should be of the type that automatically open in the event of failure of pneumatic or electric power.

Strainers are sometimes used in steam lines to protect control valves against pipe cuttings or sediment, or they may be in the return lines ahead of traps for the same reason. These are desirable devices, but it must be remembered that they too can stop the flow of steam or condensate and thus cause freezing unless they are properly serviced or are equipped with the necessary low limit controls.

System Design Is Factor in Stratification

Stratification causes perhaps as much freezing in air conditioning units as anything else. Aside from that caused by poor steam distribution, much stratification results from the type and arrangement of equipment. Most of the foregoing discussion dealt with methods of preventing freezing of the preheat coils and assuring an average leaving temperature above freezing. Where there is stratification of temperature it was stated that the use of a properly installed averaging element would satisfy this latter requirement. This, however, does not guard against freezing idle chilled water coils, spray apparatus, etc., that might be in the path of the colder air strata, nor does it eliminate the problem of poor heat distribution within the building that often accompanies stratification.

Fig. 9 is intended to show a particularly undesirable fan unit arrangement as far as stratification is concerned. Outdoor and recirculated air are introduced in two parallel streams which initiate the stratification. Damper blades are arranged to rotate in such a manner as to hinder mixing rather than aid it. Steam coils are supplied from the side that is naturally warmer. The double inlet fan does little to mix the air. As a result, one side of the distribution duct carries air that is much warmer than that on the other side. One side of the building will be too warm while the other side will be too cold, as a consequence. Furthermore, danger of freezing all of the coils exists, even though the *average* temperature of air leaving the preheater is above freezing.

The solutions to stratification problems are not simple. In some cases, because of space and other limitations, they cannot be completely solved. The arrangement shown in Fig. 10, however, indicates some of the things that can be done to help.

It is better to introduce the outdoor air and return air at opposite sides of the mixing chamber. The greater weight of cold air helps to reduce stratification if introduced at the top of the mixing chamber rather than at the side or especially at the bottom. Face and bypass dampers, or bypass dampers alone, produce stratification. A greater length of duct beyond a mixing chamber, or face and bypass dampers, or baffles of some sort, often will help.

An engineer rarely is given all the space he needs for mechanical equipment. It is lack of space that prevents application of easy methods of reducing stratification. If architects and owners could be impressed with the importance of providing enough equipment room for this and other reasons, it might be made available.

Stratification is often broken up by a fan, but this does not help equipment upstream of the fan. A single inlet fan will almost always reduce stratification but cannot be counted on to eliminate it in all cases. A double inlet fan usually does little to reduce stratification. ⧧

The author wishes to thank F. C. McIntosh, Johnson Service Co. (retired), for help in preparing this article, and W. E. Heibel, Aerofin Corp., for valuable comments and suggestions.

Unusual Air Conditioning System Meets Exacting Tolerances

. . . dictated by manufacture of jet engine components

Temperature and humidity of part of jet engine plant must be maintained at very nearly 68 F and 45 percent RH. To keep these conditions consistent, a variable false cooling load is admitted to the enclosed area to keep the compressor operating constantly. As far as possible, existing air conditioning equipment was used, to speed installation and to simplify control.

BY C. F. MOWREY
Production Engine Dept. Facilities
Aircraft Gas Turbine Div.
General Electric Co.

AS JET ENGINE components must meet exacting specifications, so must the conditions under which they are manufactured be maintained at very close temperature and humidity tolerances. Such were the demands placed on the General Electric Co. Aircraft Gas Turbine Div. plant at Evendale, Ohio, near Cincinnati.

An air conditioned area, approximately 80 × 30 ft, located on the floor of one of the factory buildings had been operating for some time. However, new developments made it necessary to establish closer control of temperature and humidity.

It was considered highly desirable to use the existing equipment to the greatest possible extent in order to save time and to make the control system as simple as possible.

The specifications called for a temperature of 68 F (± 1 F deg) and a relative humidity of 45 percent. A 5 percent variation in relative humidity could be tolerated, but it was expected that this variation would normally be held to within ± 1 percent.

Vary False Cooling Load

Since there would be interference with proper production if conditions were not consistently satisfactory, it was decided to keep the air conditioning compressor operating constantly by varying a false cooling load. This load is air admitted from non-air conditioned areas of the factory. It is humidified as it enters the conditioned area.

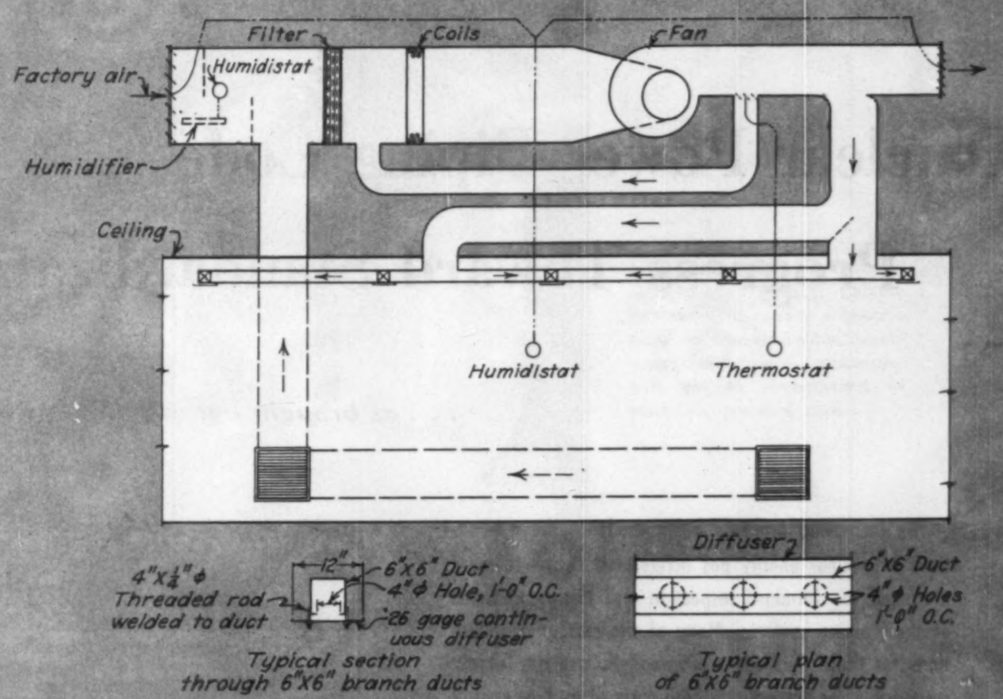
The system, which has been in operation about a year, is shown schematically in Fig. 1.

Varying amounts of air can be drawn from the factory through the dampers at the top left. From there it is passed through the coil and is finally exhausted at the right. Since the working area below has no other significant exhaust outlets, the amount of air exhausted at the right must approximate the amount of air drawn in from the factory.

The humidity in the working area is controlled by the humidistat in that area. The humidistat varies the imposed load from the factory and, consequently, the coil temperature. This method of humidity control is used in both summer and winter since the humidistat located in the upper duct actuates the grid humidifier at the air entrance.

The precoil humidistat is set for 60 percent RH. This setting not only provides more than enough moisture at all times, but, together with the factory air, imposes sufficient cooling load in winter to keep the compressor at full load without increasing the air flow from the factory to any great extent.

The temperature is, of course, regulated by the thermostat. If it drops too low the bypass damper opens wider, thus reducing the amount of cold air entering the working area by bypassing it to the entering side of the coil. If the tempera-



1 FACTORY AIR in varying amounts enters system at top left, is passed through coil, and is exhausted at right. Humidity in working space is controlled by humidistat in that area. Unit varies imposed load from factory. Precoil humidistat at factory air entrance is set for 60 percent RH. Setting provides more than enough moisture at all times, imposes sufficient load in winter to keep compressor at full load. Thermostat actuates bypass damper as necessary

ture rises, the reverse action takes place.

Although this recirculated air tends to lower the temperature of the air leaving the coil, the proportions and temperatures are such that the control is quite effective. Any slight changes that normally might be noted as a result of variation in the volume or temperature of the air supplied to the working area are not noticeable due to the method of diffused air distribution.

Use Existing Supply Ducts

At first glance a perforated ceiling might appear to be the ideal method of distribution. However, the method used in this particular case was easier to install and is more adaptable to regulation.

The existing supply ducts were utilized to supply a grid of 6 in. square ducts. As shown in the detail in Fig. 1, 4 in. diam holes on 12 in. centers were cut in the bottom of each grid. A strip of sheet metal was suspended about an inch below by bolts and wing nuts so that the width of the opening could be varied. This method made it unnecessary to vary the sizes of the ducts. At the same time it makes it very easy to balance or purposely unbalance the air distribution, depending upon the requirements.

Meet Exacting Control Needs

In addition to the control requirements of the general area, the needs of a small room within the area are even more exacting. This is handled by balancing the system so as to have a surplus of chilled air available in the duct supplying the room, and by regulating the amount delivered by a thermostat actuated damper.

As an additional precaution to minimize downtime, a hold back valve in the compressor suction line keeps the suction from going below a certain minimum. Also, a standby compressor is provided, cross connected for operation.

The operation of the system is very satisfactory. Barring the sudden addition of a large heat or humidity load (which is unusual) the temperature and humidity remain quite consistently within the predetermined tolerances.

Salient features of the system are:

1) Both temperature and humidity are controlled by movement of dampers.

2) The controls can be adjusted to provide generous movements and in effect "short cycle" frequently, while giving close regulation without the disadvantages of a short cycling compressor.

3) The control system is very simple in operation.

4) There are very few controls, and no one control is dependent upon the sequence of operation of others.

5) The same method of humidity control is used regardless of the relative humidity of the outside air. ‡

Nuclear Power Piping Codes Progress Toward Standardization

. . . as brought out at 1958 Nuclear Congress

The increasing progress being made in the applications of nuclear energy has accelerated efforts to meet the need for standard inspection and testing methods of their piping systems. Many of the current specifications for these methods are unrealistic and are largely responsible for present-day high costs of nuclear energy because they attempt to provide insurance against all contingencies. Many engineers feel that such rigid requirements are unnecessary and fail in their intent because frequently the desired effect obtained by certain ones is cancelled by another.

BY V. T. MALCOM
Engineering Consultant

and

SIDNEY LOW
Chapman Valve Mfg. Co.

REACTOR POWER PLANTS may differ in details but they are all fundamentally similar. In all plants the heat created in the reactor core by the fission process is removed by a primary coolant which may be a liquid, a liquid metal, or a gas passing through this core. The heat thus removed by the primary coolant is then converted into useful energy as in the case of the pressurized water reactor, or the heat carried by the primary coolant may be transferred to a secondary system which converts the heat to useful energy as in the boiling water reactor.

The various types of reactors and their coolants are:

Type	Typical primary coolant fluid
Pressurized gas	Carbon dioxide
Fast breeder	Sodium
Sodium graphite	Sodium
Boiling water	Water
Pressurized water	Water
Organic moderated	Polyphenyl
Liquid metal	Bismuth alloy
Homogeneous	Heavy water solution

Progress Spurs Efforts for Standardization

All of the progress being made has accelerated efforts to obtain standard practices. It is recognized that the requirements set forth in our present codes have not yet attained adequate structure for nuclear power piping systems, the fabrication requirements are not meaningful, and inspection standards are lacking.

The Code for Pressure Piping increasingly assumes the status of an enforcement code and brings to an end the long held opinion that piping offers only an insignificant hazard. The executive committee for the American Standard Code for Pressure Piping has recognized these facts, and their decision has resulted in the formation of an advisory committee on nuclear power piping.

This committee will be responsible for guidance and advice to all sections of the code committees so that the sections will contain adequate provisions for piping in nuclear installations and will search out the problems that should be covered by the code. The committee's scope of coverage includes design, fabrication, erection, testing, and inspection of piping and new materials for handling liquid metals, gas coolants, organic materials, radioactive waters, and slurries.

The executive committee also has recognized the difficulties of inspection and testing of piping because of limited access to the piping. Therefore a new committee has been organized known as "Inspection and Testing of

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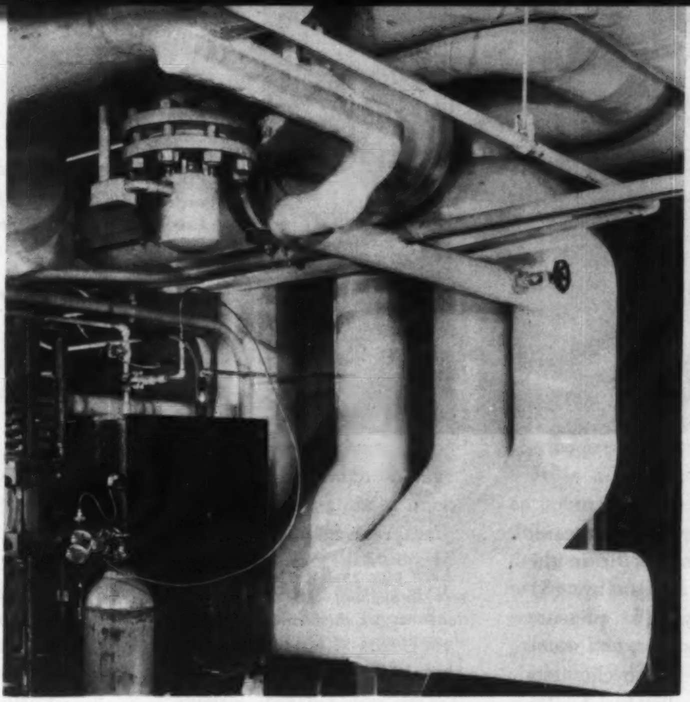
This article is abstracted from a paper presented at the 1958 Nuclear Congress held recently in Chicago.



NUCLEAR PIPING installed at Argonne National Laboratory required careful inspection prior to first operation. Standardization of such procedures will aid in development of workable, practical code

Nuclear Power Piping," with special emphasis on nondestructive testing. This committee is responsible for establishing proper techniques and standards of acceptance for piping at different levels of quality, and for concentrating on the problems of inspection and nondestructive testing as related to heat transfer media pressure piping. Also, it is responsible for establishing standards for piping materials, fabrication, and erection.

Nuclear, Pressure Service Conditions Differ

The materials used or proposed for nuclear power piping systems have been in pressure piping service for many years in high pressure, high temperature steam generation plants. Proven specifications for inspection and testing already exist, but there is considerable difference in service conditions between steam plant and nuclear plant piping.

In the nuclear plant, greatly increased thermal shock conditions may exist if liquid metals are used as the heat transfer media. Also present is a greater corrosion potential in certain aqueous systems where products become highly radioactive and must be removed to minimize activity in the loop. Thermal cycling resulting in accelerated fatigue in piping — especially in welds — is another factor, and changes in material properties due to radiation effects should also be considered. Absolute cleanliness of the piping and excellent surface finish free from crevices are more important than in steam piping. There is also the biological hazard from radiation or radioactive materials.

Since the primary loop cannot be approached this makes any leakage in the system dangerous. Consequently, maintenance is difficult and in some cases impossible. All valves and pumps must be hermetically sealed.

To obtain the proper standards is a real challenge. In accepting this challenge care must be exercised not to make changes or additions to existing specifications unless they actually contribute to better service conditions. Also, any such changes or additions must be justified as being improvements that are significant enough to warrant an increased cost and that such improvements may be attained practically.

Reactor Comprised of Three Piping Categories

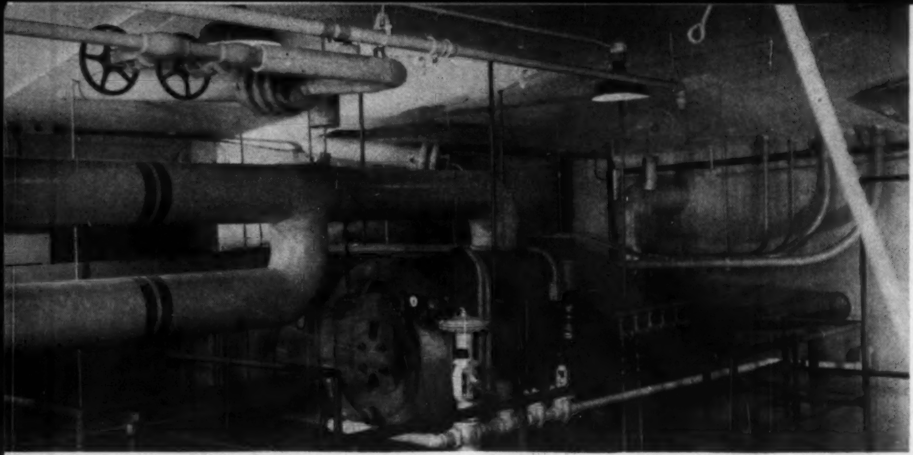
A nuclear power reactor is comprised of three piping categories:

1) Service piping (such as building piping, heating piping, refrigeration piping, pumping, sprinkler systems)
2) Steam transmission piping (secondary systems)
3) Reactor heat transfer media piping.

The first two categories will use established piping standards as defined by the code, no special requirements being necessary. The third category, however, requires special requirements and will call for special materials, new inspection and testing techniques, and nondestructive tests after fabrication and erection. The heat transfer media piping must therefore be of the highest level of quality.

The committee on inspection and testing recognizes that the first and foremost factor in nondestructive testing is standardization. Standardization is used here as the establishment of an agreed basis for the suitability of piping and component parts for the service intended.

The standards and techniques should be so written that there will be complete understanding of the inspection requirements. Defects should not be difficult to interpret. Few arguments should result as to acceptance or rejection if the standards are prepared in this way.



PIPING for nuclear plants, such as at Argonne National Laboratory, differs from that of conventional steam plants. Nuclear energy demands specific code for design, installation, and inspection of its piping systems to assure safe operation

The inspection and testing committee is giving careful study to the problem of nondestructive tests in the following areas: (1) ultrasonics, (2) radiography, (3) magnetic particle, (4) penetrant oil dye, (5) pressure testing (hydrostatic, helium mass spectrometer, and water purity), (6) welding and weldability, (7) cyclic tests for components, (8) heat loop tests for components, (9) eddy currents, (10) intergranular corrosion, (11) surface finish measurements, (12) cleanliness measurements, and (13) shock tests.

Analyze Visual Inspection

Visual examination shall always be made to the extent that it discloses defects or the likelihood of defects.

General appearance of welds or assemblies is a measure of the quality of the workmanship which can be expected in the piping system which is not visible. Wherever visual inspection indicates inferior work, no further inspection of tests will be made until this quality is improved.

Study Ultrasonic Inspection

Ultrasonic inspection is being made in a variety of ways in connection with pressure piping. These include:

1) *Manufacture*: Inspection of raw materials including ingots, billets, forgings, and intermediate tubular stock during the manufacturing process.

2) *Tubular products*: Acceptance inspection of manufacturers' tubular products to determine their compliance with existing soundness and, in some cases, dimensional specification requirements.

3) *Mechanical fabrication*: Inspection of piping for thinning, cracks, and other possible defects developed during bending, forming, or heat treatment.

4) *Welds.*

At present, at least two specifications of the American Society for Testing Materials include a provision for ultrasonic inspection as an optional supplementary requirement. These are A369-55T, "Ferritic Alloy Steel Forged and Bored Pipe for High Temperature Service," and A376-56T, "Seamless Austenitic Steel Pipe for High Temperature Central Station Service."

Paragraph S3 of A369 states:

> *Each pipe shall be ultrasonically tested to determine its soundness throughout the entire length of the pipe. Until suitable standards are established, the basis for rejection shall be a matter of agreement.*

Similarly, paragraph S7 of A376 states:

> *Each piece of pipe may be ultrasonically tested to determine its soundness through the entire length of the pipe in a manner agreed upon by the manufacturer and the purchaser. Failure to meet the requirements stated in these specifications shall be cause for rejection.*

In each case the basis for rejection is stated as a matter of agreement. In those instances where such ultrasonic inspection has been required, the basis for agreement has generally been a reference notch or, less often, a drilled hole whose dimensions are related to wall thickness. For example, in one instance the notch represents a depth of not less than 3 percent of the nominal wall thickness or 0.004 in. (whichever is the greater) and an included angle of not over 30 deg, and an axial length of approximately 1½ in. The ultrasonic beam does not compare the depth of the reference notch directly with the depth of a defect, but it more nearly compares areas exposed to the beam.

When ultrasonic inspection is considered solely from the standpoint of practicability for immediate inclusion in code practice, the following is suggested:

1) Ultrasonic inspection of purchased and fabricated pipe should be specified for applications in nuclear power piping where the critical nature of the service warrants the expense to provide assurance of quality required.

2) Pending the development of quantitative reference standards for weld defects, complete ultrasonic examination may find particular applications as a method of selecting the locations in weld joints where other methods of inspection should be used.

By using ultrasonic inspection it is possible to reveal discontinuities not capable of being revealed by any other inspection methods.

In examining this further, there is a great need for standardization of test procedures, inspection references, and interpretation of results, and in training operators.

It is probable that there will be no generally acceptable quantitative reference standards available in the near future for ultrasonic inspection of welds. A reference standard has been developed in Germany which seems to give excellent results, but it has not been used in the U. S. to any extent.

Study Radiographic Inspection

Radiography is worth no more than what can be read from the film, so presently there is considerable activity in devising more effective means of radiographic procedure and the interpretation of the radiographs for the thick wall sections used in nuclear piping systems.

For shop assembly inspection, special high voltage x-ray equipment can be used for the examination of thick wall sections. By the use of this high voltage equipment the outline of penetrameters of thicknesses of 0.5 percent of the heavy wall thickness (up to 14 in.) is readily seen.

The examination of welds fabricated in the field, however, is quite a different matter. This is especially true where the primary loop has a rather complicated configuration. Therefore it appears that the present inspection standards of radiography are not adequate.

Magnetic Particle Inspection Abused

Magnetic particle inspection has been subject to more abuse and misinterpretation than any other method of inspection. The equipment required for performing magnetic particle inspection is readily available throughout industry, since welding generators, rectifiers, and batteries can be used as the source of magnetizing current.

As late as 1957, carbon steel piping components were being produced for nuclear power service with no specific acceptance standards for magnetic particle inspection. Specifications merely stated "magnetic particle inspection required."

In all cases where surface defects of a crack or crevice nature are observed, removal of the crack or crevice shall be achieved, or other methods of inspection such as radiography or ultrasonic procedure shall be used in order to establish the seriousness of the defect and the possibility of effecting satisfactory repair.

The magnetic particle inspection method is excellent in the examination of field welds for random defects that are apt to be located at or near the surface. However, in order to conduct the test properly and obtain satisfactory results, the surface of the welds to be inspected must be prepared by machining or grinding, or false indications may result when the surface of the weld is examined.

Magnetic particle inspection is therefore recommended only as an aid to visual inspection and cannot be recommended at this time for subsurface defects as it does not lend itself to measuring depth of defects but only to locating the presence of defects.

The one inspection method that has done the most to impair delivery and raise the cost of components for nuclear piping is the penetrant colored or fluorescent oil inspection method. Stringent surface finish requirements on the outside of austenitic stainless steel nuclear power piping components have been based on erroneous concepts of penetrant oil inspection.

Problem Complicated by Lack of Standards

The problem is complicated by the complete lack of acceptance standards other than those tabular types that are based on number and size of the indications. Basically, the problem is not one of the inspection media lacking sensitivity, but one of the inspection media having too great a spurious sensitivity.

It is a popular misconception that grinding is the optimum surface preparation for penetrant colored or fluorescent oil inspection. If one wishes to hide surface defects on austenitic stainless steel weldments, it is only necessary to grind the surface, using techniques that will smear the adjoining metal over the edges of the true defects. Abrasive grit blasting, using sharp, free cutting alundum, silicon carbide, or similar abrasives, is an excellent method of preparing the surfaces of castings and weldments for penetrant colored or fluorescent penetrant oil inspection.

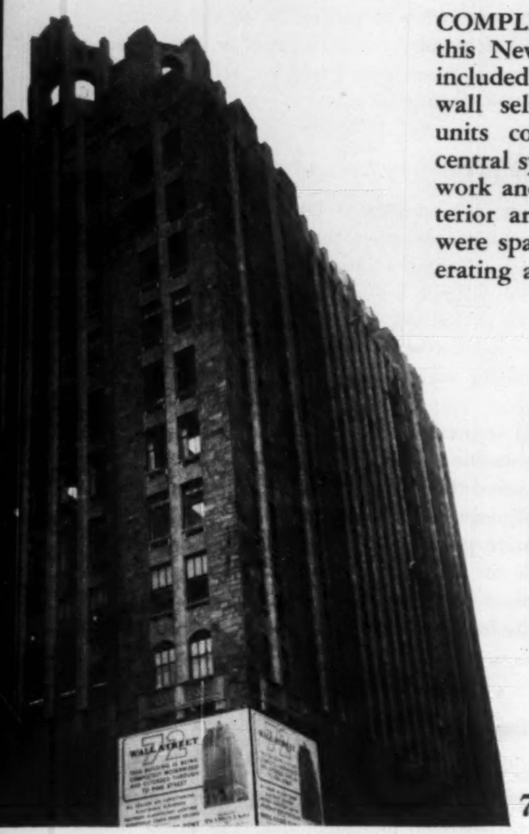
Field Welding May Cause Failures

Frequently, stainless steel tubing used in these installations has lacked sufficient mechanical strength. Metallurgical examination has indicated that the tubes had been weakened by intergranular corrosion which may have been caused, prior to or during installation, by incorrect heat treatment, pickling procedures, or field welding. Since it cannot be known how many of these tubes are structurally weak and since the tubes are welded in place and have to be kept in the system, a nondestructive test was needed to determine the extent of the condition.

Usually, failures from intergranular corrosion are caused by carbide precipitation when austenitic stainless steels are held in the sensitizing range between 800 to 1600 F — such as accomplished during welding. The chromium carbides are precipitated in the grain boundaries, leaving chromium lean areas. These depleted areas are subject to an accelerated attack when in service.

It was of great importance to know whether the welds had been subjected to carbide precipitation causing intergranular corrosion. Therefore studies were conducted to determine a means of nondestructive testing applicable to tubes installed in a system. R. C. Robinson, DuPont Laboratory, Savannah River, Ga., developed an eddy current instrument which indicates the relative degree of intergranular corrosion present in austenitic stainless steel tubes. By the use of such an instrument on installed tubing, 1 percent difference in resistivity is detected between sample tubes and the tubes under test.

This discussion of the efforts being made toward the standardization of nuclear power piping will be continued in an early issue. ‡



COMPLETE MODERNIZATION of this New York City office building included installation of through-the-wall self-contained air conditioning units comprising perimeter system, central system with low velocity duct-work and ceiling diffusers serving interior areas. Factors affecting design were space limitations, flexibility, operating and maintenance costs.

Air Conditioning Modernizes 15-Story Office Building

72 Wall St.'s face lifting, expansion provides for year 'round air conditioning of entire building by three systems totaling 552 tons cooling capacity.

BY WILLIAM R. ERIKSEN
Chief Mechanical Engineer
George A. Fuller Co.

LONG a landmark on New York's lower Wall St., the 15-story 72 Wall St. Bldg. was completely modernized and enlarged and extended with a 15-story addition during 1956-57.

Total rentable floor space of the combined modernized structure is 255,377 sq ft. Of this, 43,377 sq ft in the lower floors of the new portion of the building are occupied by the U. S. Post Office Dept. The rest of the building is rented as multiple occupancy office space.

Because of the special requirements of the space occupied by the Post Office, typical floors begin at the sixth and extend through the 12th. Setbacks begin above the 12th floor. Each of the typical floors has a net rentable area of 18,000 sq ft, of which 10,000 is in the old portion of the building and 8000 in the new.

3 Systems Condition Building

The building is completely air conditioned by three separate systems with a combined capacity of 552 tons. Two of the systems are of conventional design and construction. The third, a perimeter system, accounts for over half of the total capacity and is believed to be the first system of its type installed in a New York office building.

Two of these systems—perimeter and interior—comprise the new air conditioning installation. A third, installed some years ago, supplies the Post Office area. The capacities of the three are as follows:

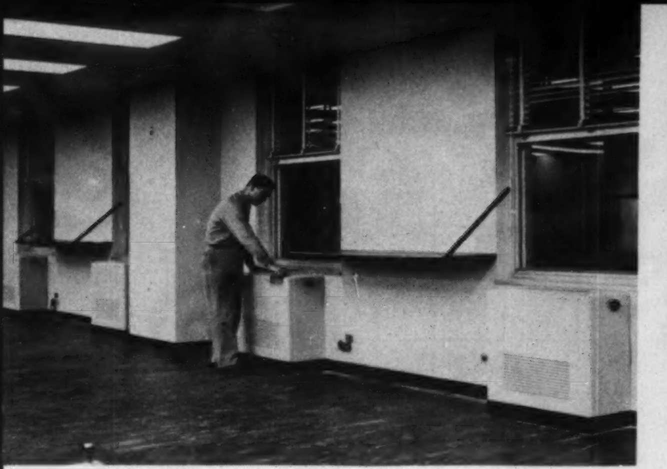
Perimeter	292 tons
Interior	140
Post Office	120
	552 tons

This article discusses only the systems serving the tenant office area, and excludes the Post Office area.

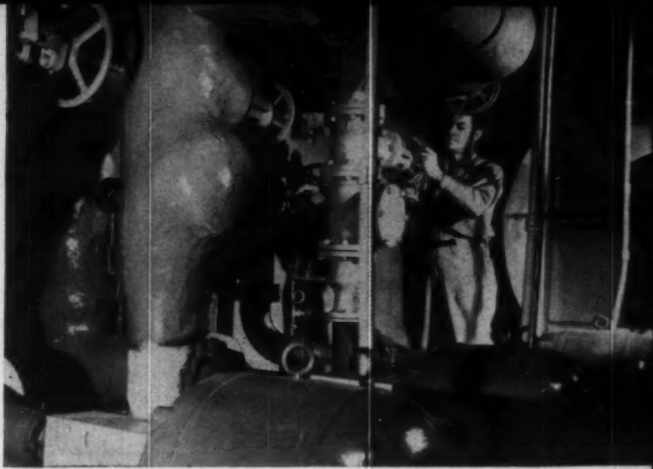
Self-Contained Units Outside

The perimeter system consists of a series of self-contained air conditioning units, each of which is complete with a refrigeration compressor, steam heating coil, controls, washable type filters, filtered outdoor air intake, necessary electrical protective devices, and condenser air supply and exhaust.

Each of the 459 units is installed



OUTSIDE OFFICES are heated or cooled by 459 units. Each cabinet houses ¾ or 1 ton cooling unit, separate heating coil connected to building's steam system. Holes for intake grilles were cut in masonry beneath windows



PUMPS, located in basement, circulate cooling water from roof towers to condenser, chilled water throughout building interior. Chilled water pump handles 358 gpm; condenser pump delivers 450 gpm. Third unit, rated at 450 gpm, is standby

under a window. Individual exterior private offices or bays can have both cooling and heating as desired by the occupant.

The units were installed through the wall and require no inlet nor outlet cold water piping. Instead, they connect to the existing steam piping in the old portion of the building. In the new portion it was, of course, necessary to install a conventional steam piping system.

The installation of these units required that the general contractor furnish a louvered opening in the outside wall, a source of electrical power to the compressor and fan, and supply and return steam connections. No condensate drain is necessary since the condensate is re-evaporated and returned to the outside air in the higher temperature condenser air.

Each Floor Has Own Unit

The interior system comprises a network of low velocity ductwork with ceiling diffusers spaced at approximately one per bay. Each floor has its own air conditioning unit, which is supplied with chilled water from the central cooling plant. This is a desirable arrangement since it permits each tenant to have conditioned air supplied to his office during overtime periods at a low operating cost. Individual floors can be conditioned without the necessity of conditioning a series of floors.

The water chilling plant employs two 75 hp compressors, either or both of which may be operated as required. The use of a low velocity system makes it possible to keep the fan horsepower at a minimum. Temperature control is so designed as to use the simplest possible arrangement, thereby providing low maintenance cost.

Why Choose These Systems?

In selecting these types of interior and perimeter systems, the following factors were considered:

1) *Initial cost.* The combination system was found to cost less than $900 per ton of refrigeration capacity for the completed job.

2) *Floor space required by a peripheral system.* Each unit requires approximately 3 sq ft of floor space, or a total of about 1400 sq ft for all 459 units. This economy gives the tenant a maximum of usable space. It was not necessary to furr in existing columns since vertical air ducts and new piping were not required. Again space was saved.

3) *Machinery and fan room space available.* Space ordinarily allocated for the refrigeration equipment, pumps, cooling tower, fans, dehumidifiers, etc., was saved. Separate fan rooms for the interior system required more space than would be required by conventional systems. However, this space contributed to the low initial cost and "after hour" flexibility.

4) *Flexibility.* The use of one controlled peripheral unit at each window is one way to provide maximum flexibility to the individual tenant.

5) *Operating cost.* It is estimated that the system will provide savings in horsepower, electricity, and water consumption.

6) *Maintenance cost.* Maintenance cost should be no greater than for the completely centralized system. By a properly planned preventative maintenance program this cost can be minimized. Maintenance contract proposals indicate that this cost can be held to a reasonable amount.

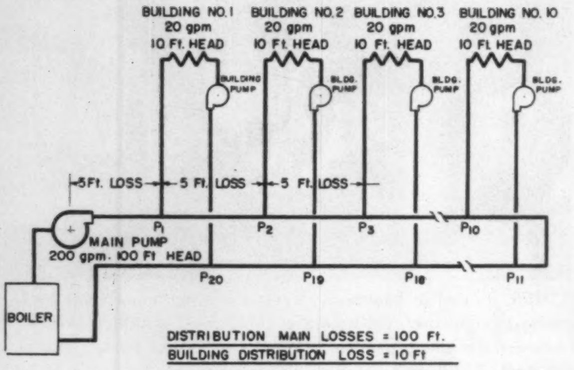
7) *Life expectancy of equipment.* With proper maintenance, at least 15 years service is expected from the peripheral units.

Steam for heating is obtained from the New York Steam Corp., and is metered at the entrance to the building.

The enlarged, modernized building was reopened for complete occupancy on May 1, 1957. The systems have now operated through all four seasons of one year. The tenants have found it to be highly acceptable and it has come up to all expectations.

The mechanical (heating, piping, and air conditioning) contractor was Eugene J. Brandt Co. General contractors in charge of the modernization were George A. Fuller Co. and J. H. Taylor Construction Co., Inc. ≠

Photos courtesy Remington Corp. and Carrier Corp.

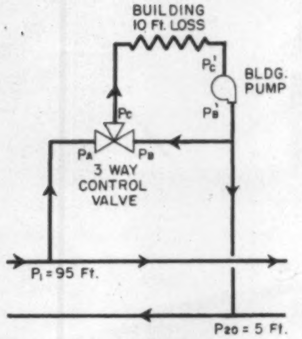

BUILDING NO. 1
20 gpm
10 Ft. HEAD
BUILDING PUMP
BUILDING NO. 2
20 gpm
10 Ft. HEAD
BLDG. PUMP
BUILDING NO. 3
20 gpm
10 Ft. HEAD
BLDG. PUMP
BUILDING NO. 10
20 gpm
10 Ft. HEAD
BLDG. PUMP
5 Ft. LOSS
5 Ft. LOSS
5 Ft. LOSS
P1
P2
P3
P10
MAIN PUMP
200 gpm. 100 Ft HEAD
P20
P19
P18
P11
BOILER

DISTRIBUTION MAIN LOSSES = 100 Ft.
BUILDING DISTRIBUTION LOSS = 10 Ft

$P_1 = 95$ Ft.
$P_2 = 90$ Ft.
$P_3 = 85$ Ft.
⋮
$P_{10} = 50$ Ft.
$P_{11} = 50$ Ft.
⋮
$P_{18} = 15$ Ft.
$P_{19} = 10$ Ft.
$P_{20} = 5$ Ft.

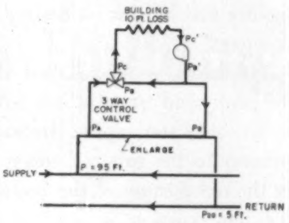
BLDG NO 1 = $P_1 - P_{20} + P_C = 95 - 5 + 10 = 100$ Ft.
BLDG. NO. 2 = $P_2 - P_{19} + P_C = 90 - 10 + 10 = 90$ Ft.
BLDG. NO. 3 = $P_3 - P_{18} + P_C = 85 - 15 + 10 = 80$ Ft.
⋮
BLDG. NO. 10 = $P_{10} - P_{11} + P_C = 50 - 50 + 10 = 10$ Ft.
} PUMPING HEAD AVAILABLE ACROSS BUILDING

7 CENTRAL BOILER PLANT with main pump circulating water to many buildings must have distribution mains sized to take care of distribution main losses. (Figs. 1 through 6 appeared in the April issue)


BUILDING
10 Ft. LOSS
P'C
BLDG. PUMP
P'B
PC
PA
PB
3 WAY
CONTROL
VALVE
P1 = 95 Ft.
P20 = 5 Ft.

UNBALANCED FORCE ON CONTROL VALVE = PRESS. DIFF. x DISC AREA
FORCE ON 1½" CONTROL VALVE $\frac{90}{2.3} \times 1.75 = 69$ lbs
FORCE ON 2" CONTROL VALVE $\frac{90}{2.3} \times 3.15 = 126$ lbs

8 SINCE BALANCE CONTROL from central boiler plant is impractical, individual building control is usually provided for. If misused this can further aggravate unbalance


BUILDING
10 Ft. LOSS
Pc'
Pc
PB'
PB
3 WAY
CONTROL
VALVE
PA
PB
ENLARGE
P = 95 Ft.
SUPPLY
RETURN
P20 = 5 Ft.

9 TO REMEDY UNBALANCE shown in Fig. 8, use of primary, secondary loop is recommended. Connections to building are taken directly off loops to equalize pressure

How to Prevent Unbalance In Hot Water Heating

. . . by careful design, proper installation

The evolution of hot water heating has been marked by continuing efforts to correct the problem of system unbalance. In the April issue the author described the three basic system types and how unbalance manifests itself in each. Typical heating installations are discussed here, as is the widespread use of hot water for process applications in industry.

BY T. ROBERT STEVENS
Vice President
Sarcotherm Controls, Inc.

ANOTHER type of system that has come into use in the last few years is shown in Fig. 7. Projects with as many as 80 buildings located in an area of several square miles have employed hot water heating systems. Such a system may use a large central boiler room with a main pump circulating water through the distribution mains which are sized to take care of the distribution main losses. Each building is served by its own circulator to supply the required amount of water.

The available pumping head in the buildings nearest the boiler room is considerably larger than required in the building. As a result, even when the building circulator is shut off the main pump has sufficient head to continue to circulate water and heat the building.

Since control from the central boiler room is impractical, individual building control is usually provided for. Thus the situation may be further aggravated when individual buildings employ three-way mixing valves, as shown in Fig. 8. Examining the flow conditions it is apparent that the force acting on the hot water port of the control valve will be governed by the pressure differential across the supply and return mains. Fig. 8 shows that this force, depending on the size of control valve, can be considerable and sometimes can overcome the force available to close the valve in mild weather.

In such cases, hot water will continue to circulate through the building, thus making control impossible. Even if balancing should be successful by restricting the amount of flow to each building, the force acting on the control valves near the boiler room will make control ineffective. This differential pressure condition will vary from building to building and is difficult if not impossible to correct in the field.

To remedy such an unbalance, the use of primary and secondary loops is recommended, as shown in Fig. 9. Here a loop is connected across the supply and return mains. Connections to the building are taken directly off the loop, thus equalizing the pressure at each building supply and return. In this manner the building circulator can once more assume its proper role by circulating the required amount of water through the building, unaffected by pressure conditions across the primary supply and return mains, or the flow through the primary circuit.

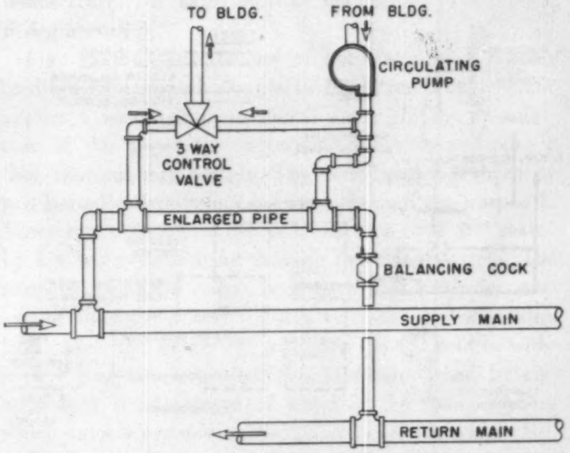
It is recommended that, in order to reduce the pressure differential across points P_a and P_d, the loop be enlarged. The flow in the primary circuit will not affect the flow in the secondary loop and vice versa.

Fig. 10 illustrates a typical hookup of such a building, where a balancing cock on the loop may be used with a direct return system to allow each loop to take the required amount of water from the mains, thereby assuring proper flow as established by design conditions.

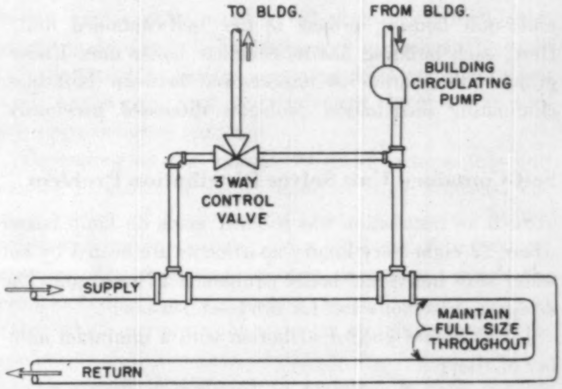
Another method of solution is shown in Fig. 11. Here the supply and return to the individual buildings is connected directly into the main supply to form a one-pipe system. It is necessary, however, to maintain full main sizes throughout, as well as limit the pressure drop to a minimum across the building connection.

The disadvantage of this system is that the water temperature at each successive building decreases as each building returns its water directly into the supply main. However, it is rather easy to calculate the temperature drop caused by mixing at each successive loop and thereby determine the highest temperature water required at the boiler.

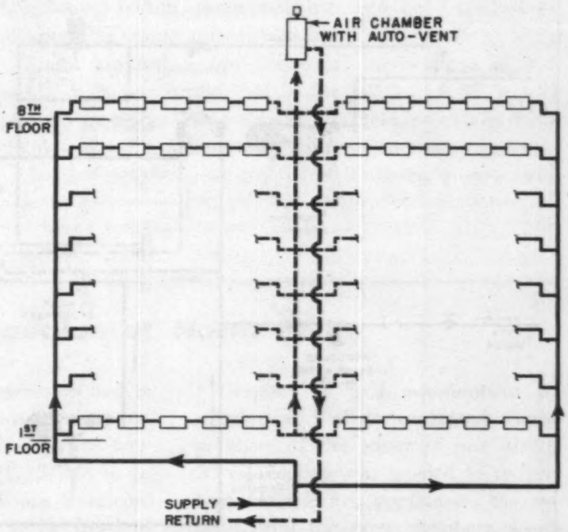
Another interesting type of heating system for the



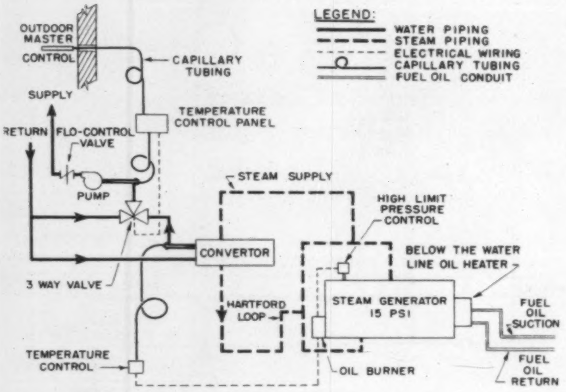
10 TYPICAL HOOKUP of primary, secondary loop shown here. Balancing cock on loop may be used with direct return system to assure proper design flow



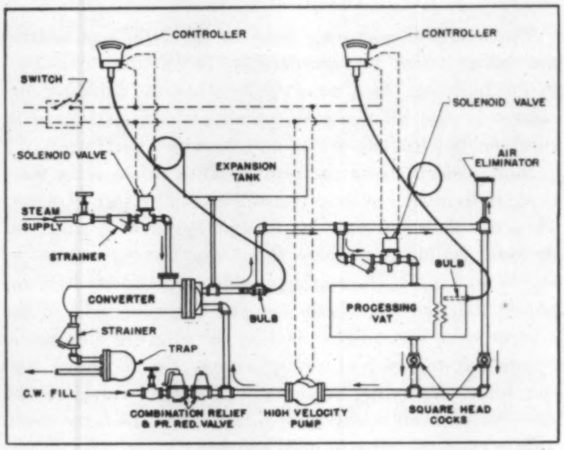
11 ANOTHER SOLUTION to unbalance has supply, return piping to individual buildings direct connected to main supply to form one-pipe system



12 TWO-PIPE REVERSE RETURN system, as depicted above, is successfully integrated with perimeter type heating. System uses few risers


LEGEND:
WATER PIPING
STEAM PIPING
ELECTRICAL WIRING
CAPILLARY TUBING
FUEL OIL CONDUIT
OUTDOOR MASTER CONTROL
CAPILLARY TUBING
SUPPLY
TEMPERATURE CONTROL PANEL
RETURN
FLO-CONTROL VALVE
PUMP
STEAM SUPPLY
HIGH LIMIT PRESSURE CONTROL
CONVERTOR
BELOW THE WATER LINE OIL HEATER
3 WAY VALVE
HARTFORD LOOP
STEAM GENERATOR 15 PSI
FUEL OIL SUCTION
TEMPERATURE CONTROL
OIL BURNER
FUEL OIL RETURN

13 15 PSI STEAM BOILER is used to generate hot water with this original hookup. This type of self-contained plant serves individual buildings


CONTROLLER
CONTROLLER
SWITCH
SOLENOID VALVE
SOLENOID VALVE
EXPANSION TANK
AIR ELIMINATOR
STEAM SUPPLY
STRAINER
BULB
CONVERTER
BULB
PROCESSING VAT
STRAINER
TRAP
C.W. FILL
COMBINATION RELIEF & PR. RED. VALVE
HIGH VELOCITY PUMP
SQUARE HEAD COCKS

14 HOT WATER may be used in fur processing where pelts are processed in vats with solutions heated by hot water. Temperature of solution must be constant 24 hr a day

multi-unit housing project is the "self-contained unit." Here, each building has its complete boiler unit. Underground distribution is unnecessary between buildings, eliminating distribution problems discussed previously.

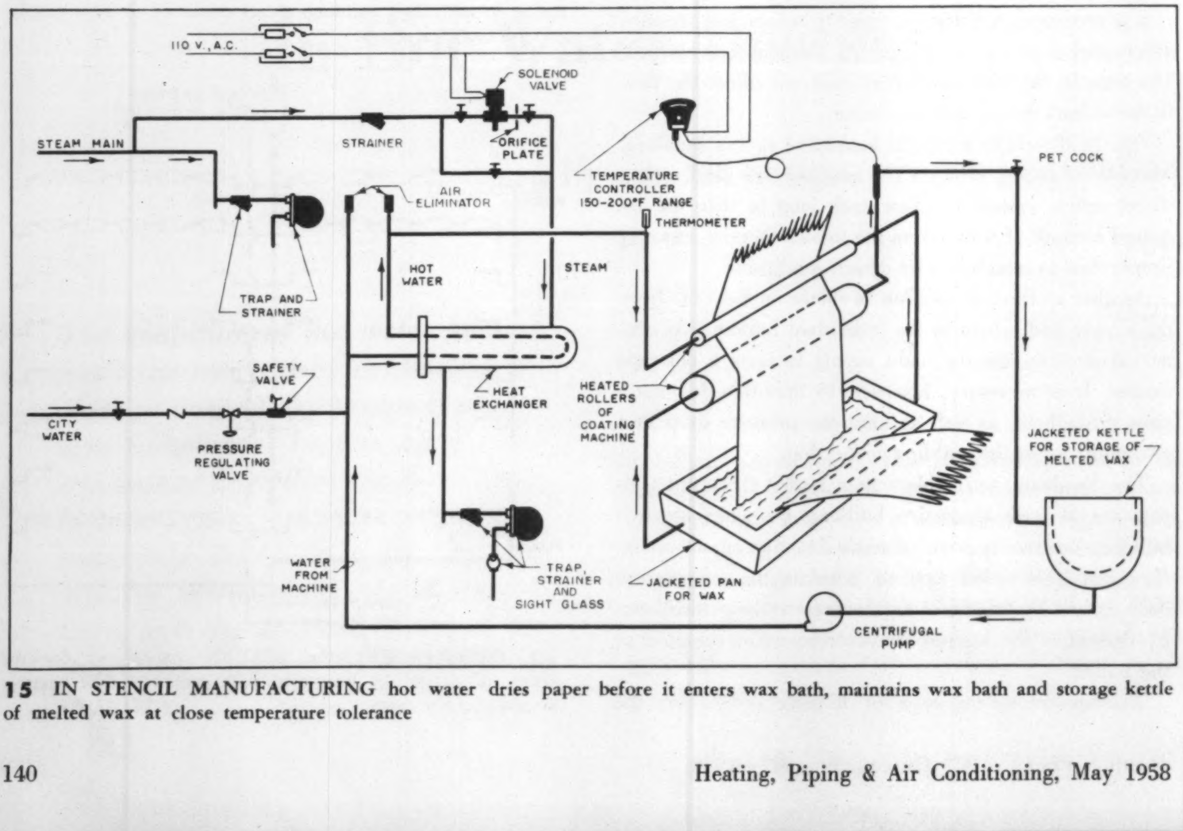
Self-Contained Unit Solves Distribution Problem

Such an installation was recently made on Long Island where 32 eight-story luxury apartments are heated by hot water with individual boiler equipment in each unit. The designer chose hot water for two basic reasons:

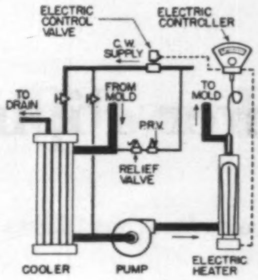
1) To obtain good distribution with a minimum number of risers

2) To install relatively simple control equipment in solving a complex control problem.

As shown in Fig. 12, the two-pipe reverse return system is successfully integrated with the aim of using few risers by employing perimeter type heating. A 15 psi steam packaged boiler is used to generate hot water with a rather original hookup, as shown in Fig. 13. The steam flow to the convertor is regulated by controlling the burner, with a high limit pressure control and low limit water control also capable of starting and stopping the burner. Condensate is returned to the boiler by gravity. Heaters located below the water line are used for fuel oil and domestic hot water heating.


110 V., A.C.
SOLENOID VALVE
STEAM MAIN
STRAINER
ORIFICE PLATE
PET COCK
TEMPERATURE CONTROLLER 150-200°F RANGE
AIR ELIMINATOR
THERMOMETER
HOT WATER
STEAM
TRAP AND STRAINER
SAFETY VALVE
HEAT EXCHANGER
HEATED ROLLERS OF COATING MACHINE
CITY WATER
PRESSURE REGULATING VALVE
JACKETED KETTLE FOR STORAGE OF MELTED WAX
WATER FROM MACHINE
TRAP, STRAINER AND SIGHT GLASS
JACKETED PAN FOR WAX
CENTRIFUGAL PUMP

15 IN STENCIL MANUFACTURING hot water dries paper before it enters wax bath, maintains wax bath and storage kettle of melted wax at close temperature tolerance



16 HEATING, COOLING UNIT is designed primarily to provide controlled (temperature and pressure) supply of water throughout passages of plastics mold

An outdoor controlled modulating three-way valve varies the temperature of supply water to the heating units in accordance with changes in outdoor temperature. Completely automatic program operation of night setback, rapid morning heatup is provided for.

The advantage of the self-contained unit naturally lies in the fact that one unit does not depend on the other, can be isolated quickly in case of trouble, and eliminates piping between buildings. The chief disadvantage is the multiplying of mechanical equipment with its possible sources of mechanical failure and possible difficulty in multiple maintenance.

Hot Water Has Widespread Uses in Industry

The increased use of hot water has not been restricted to heating alone. Industrial and process equipment has recently employed hot water where previously steam was used. Here again the ease of controllability, quick response, and the ease of temperature variation have contributed greatly to the use of hot water as a heating medium.

As illustrated in Fig. 14, hot water may be used in a typical fur processing plant where Persian lamb and other pelts are processed in vats filled with a solution heated by hot water. The temperature of the solution must be kept constant 24 hr a day to insure uniform processing. Overheating the solution would destroy pelts worth thousands of dollars. Underheating would produce a substandard finish.

Hot water was selected because the temperature must be easily varied to suit the different types of pelts and finishes. Steam coil heating had to be ruled out because the heating surface in the baths cannot reach too high a temperature. The baths must be maintained to within ½ F deg accuracy.

Fig. 15 indicates the use of hot water as a heating medium in a stencil manufacturing plant. The machine applies a wax coating to stencil paper. In the manufacture of this paper the surface must be covered with a thin, uniform wax coating. The stencil paper is dried by two heated rollers before it passes through the wax bath. These two rollers and the jacketed wax bath are heated by hot water circulating through the closed system. The temperature of the rollers, wax bath, and kettle for storage of the melted wax (which is transferred from the kettle when the wax in the pan runs low) is held to within 1 F deg automatically. This is accomplished by circulating a small amount of water in the stencil system which quickly responds to control and eliminates lag.

Another application, as shown in Fig. 16, is a heating and cooling unit designed primarily to provide a controlled (temperature and pressure) supply of water throughout the passages of a plastics mold or through the hollow center of a rotating cylinder over which sheet plastic is drawn. It is first necessary to preheat the mold or cylinder to the desired operating point and then, when work commences, cool the equipment. In this way uniform production is obtained.

Depending on the number of mold sections this unit can be furnished in single, dual, or triple sections. The unit consists of a circulating pump, an electric heater, relief and makeup valves, and a shell and tube heat exchanger. The three-stage electric controller controls the electric heater (in two stages) as well as the solenoid valve which permits cold water to circulate through the cooler.

The system is designed to maintain a high velocity across the electric heater element which will operate at a few degrees above the selected temperature and thus have a relatively long operating life. Due to the pressurized circulating system, these machines can be furnished to attain water temperatures up to 300 F.

These are but a few industrial applications of hot water. It is recognized that in the years to come it will play an ever increasing role in this field, especially with the development of high temperature hot water.

Another article to be published in an early issue will present some valuable pointers on proper installation of hot water heating systems. ⧧

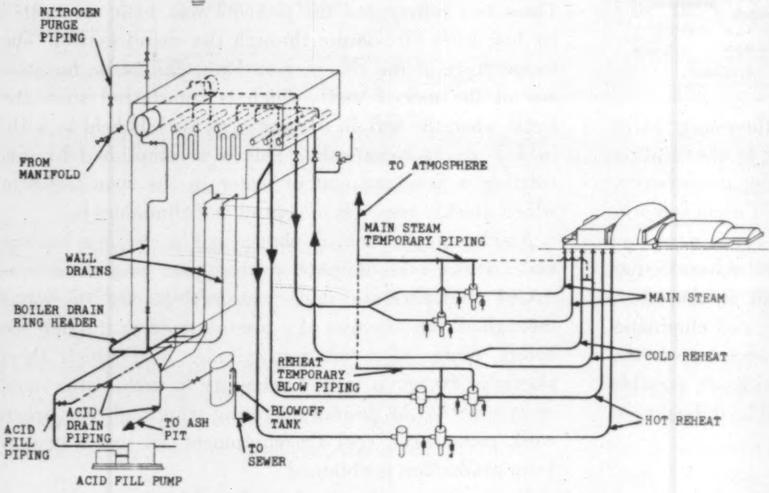
Air Conditioning Cools Nautilus at North Pole

Air conditioning at the North Pole may sound as far fetched as selling refrigerators to Eskimos, but crew members of the USS Nautilus who enjoyed its benefits while living for weeks under arctic ice know better, according to Carrier Corp.

Submerged for days under the polar cap, the crew members had to have a proper balance of temperature and humidity. Air pressure, temperature and humidity all had to be maintained at close to sea level conditions. The air had to be freed of excess moisture and dangerous carbon dioxide exhaled by the crew.

Despite the cold environment in which the Nautilus operated (temperature of the water is just above 28 F) cooling was needed to reduce heat from lights, appliances, the reactor, and the crew members. Conditioned air is therefore as necessary at the Pole as it is anywhere. ⧧

Temporary Power Piping Is Tool



1 SUGGESTED ARRANGEMENT for temporary acid fill and drain piping and nitrogen purge piping has helped to reduce time needed for testing

BY J. A. DONALD*, N. A. MILLER*, and C. D. BLANCKE*
Sargent & Lundy, Consulting Engineers

IN LAYING PLANS for the erection of any large steam-electric power plant, the operating date, or date when such a plant will be capable of supplying commercial power at full capacity, is always a prime consideration. Too many users depend on such a power source for this to be otherwise. All phases of the planning, design, construction, and testing of the plant and its equipment to meet this date must be carefully scheduled and coordinated.

A key phase in meeting the deadline is the testing of mechanical equipment before it is put into useful operation. Temporary power piping is a valuable tool which can be used to expedite this testing.

Cite Typical Plant

For this discussion, assume that a typical unit of 150,000 kw net capacity consists of one boiler and one turbine, with coal and gas as fuels. Also assume that this is an addition to an existing station.

The following piping services should be completed prior to the testing:

1) The boiler water supply system, including treating plant and storage facilities, should have been installed and tested.

2) The boiler feed pump likewise should have been installed and tested.

3) Temporary instrumentation for temperatures and pressures should have been provided for spot checking of piping. Also, trams should be in place to permit checking of piping movement.

One of the most important and most overlooked items in the plant before any testing can be done is the completion of the house service water piping system. Usually, this water supply system serves as a cooling medium either directly or indirectly to heat exchangers, glands, and bearings throughout the plant. Also, often the service water system is an integral part of the plant fire protection system. Thus, this service water system should be one of the first installations in the piping system to be completed.

The system next in importance is the air supply. The new air compressors should have been tested early, so that their reliability and availability will be proven. The branch air piping systems should also have been placed in service to enable instrumentation and controls to be tested and set for operating conditions.

One of the most important items, basic in obtaining

This article has been abstracted from a paper presented at the 20th annual American Power Conference held recently in Chicago.

**The authors are mechanical engineer, electrical engineer, and construction engineer, respectively.*

To Speed Power Plant Completion

. . . by permitting testing of equipment, components prior to operation

continuity during initial operation, is treated water. The entire water treating plant should have been installed and made ready for automatic control.

Preliminary operation requires a number of temporary piping connections. A few of these are:

1) Storage water heating system
2) Acid fill piping
3) Acid drain piping
4) Nitrogen purging piping
5) Steam blowout piping.

Acid Wash Piping Complex

Acid wash involves more temporary piping and connections than any other procedure and should be planned under the direction of the boiler manufacturer's representative. He should in turn supervise and be responsible for all activity involved in this particular operation.

For preheating all water introduced to the boiler, either as a part of the acid solution or a rinse solution, a temporary steam line should be run directly to the demineralized storage tanks and immersed directly into the water so as to allow steam to bubble directly with the water.

Temporary connections will also be required to transport the acid from a truck to an acid mixing chamber where it will be mixed, using warm water. From the mixing chamber it will be pumped by an acid filling pump through a temporary line into the boiler. This line should be sized large enough to fill the boiler within a reasonable time.

A major concern is filling the boiler with acid solution or, during post-boil, with alkaline solution. If all wall drains, including blowdown valves, are terminated in a ring header at the base of the boiler, it will be possible to pump the acid solution into the header and control the fill through the wall drains. The same procedure may be reversed in the case of draining the boiler.

Temporary piping will be required at the top of the boiler to handle inert gas, such as nitrogen, during draining and rinsing operations. During construction of a unit of this size, a large quantity of acetylene and oxygen is required throughout the building. A neat provision for handling these gases consists of a vertical header extending from grade to the top of the building and manifolded to accommodate the bottles at grade. If this scheme has been provided, the same header may be purged and used to convey the nitrogen to the top of the boiler. This can provide a considerable saving in cost.

Acid Disposal Is Big Concern

Temporary drain piping will be needed to handle the acid from the boiler to a point of disposal where it may be neutralized, after which it will be spilled to a river or other large body of water.

One of the major concerns in draining the acid is the disposal problem. This should be considered in evaluating alternate ash pit disposal facilities at the time of the original plant layout. Not only is the problem of actual disposal of concern, but also the neutralizing required prior to releasing the solution for free flow. Consequently, if the thought of acid wash is entertained at all, these minor connections should be incorporated into the original piping design.

Fig. 1 shows a suggested arrangement for the acid fill and drain piping and for the nitrogen purge piping which has proven to be helpful in reducing the time required for these operations.

Blowing Main Steam Lines

The temporary piping required for blowing the main steam lines usually involves fairly robust pipe with bracing, guiding, and lashing. This piping is arranged to blow the steam line to the turbine, as a first step, and to the reheat lines and reheater, as a second step. The piping required to blow the main steam line consists of a connection from a temporary flanged cover on the main steam valve to an open discharge outside the building. The piping required for blowing the reheat lines and reheater consists of a connection from the temporary cover on the main stop valve to the cold reheat line, a blind in the latter to keep the blowing steam out of the turbine, and a temporary flanged cover on the intercept valve with connections to the open discharge line.

This temporary piping should be carefully designed with spools of the proper length and flanges in the proper places so that changes in connections from the first to the second step can be made without loss of time.

In designing the plant, portions of the piping which have to be changed for blowing should be provided with flanged connections. By doing this, sections or spools may be removed and reinserted as required.

Check Other Possibilities

Several additional temporary connections may be desirable although they are not mandatory. They will tend to expedite the work, but studies should be made to justify such installations economically. Some of the more tried and useful connections warrant mention:

1) During startup, especially at light loads, it is almost impossible to hold down the boiler drum level (except by hand control) while a feed pump is running. This difficulty is due to seepage across the feedwater regulating valve and, in the case of controlled circulation boilers, to injection water provided via the boiler feed pump. The simplest solution is to make a temporary connection between the lower blowdown header and the miscellaneous hot water drain tank. The level is best trimmed by draining the economizer into the header and on to the tank from where it is returned to the d-c heater via the heater drain pump.

2) Another useful tie is a temporary connection from the condensate line entering the d-c heater to the condenser. A blind is installed in the condensate line between the temporary connection and the heater. It is then possible to flush and test the system thoroughly. After flushing, it is possible to place the system under automatic control, checking the makeup and spill and recirculating the system under simulated operating conditions yet independently of other portions of the plant.

These are just a few of many possible time saving and practical temporary connections which have been used. With a little ingenuity many more may be devised which will aid new plant startups and shorten the preliminary operating period. ╪

IN PLANT OPERATION —

Maintenance Is Key to Big Savings

. . . through cooperation, planning

The role that good plant maintenance plays in reducing operating and replacement costs and minimizing production downtime was reflected at the recent Plant Maintenance and Engineering Conference in Chicago. Here, a spokesman tells how the lifetimes of motors and bearings can be lengthened through proper lubrication.

In last month's issue, other speakers discussed how maintenance pays off in small plants, how a schedule should be set up to include all maintenance operations, and how power waste is money down the drain.

• proper lubrication increases motor, bearing longevity

"It is axiomatic that rotating electrical equipment such as a motor, if applied properly and operated properly, will last longer and require less maintenance if it is kept clean and adequately lubricated," said M. J. Wohlgemuth, assistant to manager, service department, apparatus division, Westinghouse Electric Co., East Pittsburgh, Pa.

"The maintenance department in a plant must assume, after an installation has been completed and turned over to the operating department, that the equipment has been applied properly. The maintenance engineer therefore would not question the horsepower rating of the motor, the type of motor, or the operating characteristics until trouble develops which cannot be attributed to any other cause than misapplication.

"Fortunately, such cases are rather

rare, but the maintenance engineer should be able to recognize the problem and make recommendations for correction.

"A good example is that involving local atmospheric conditions. An open motor has been supplied for a drive where the surrounding conditions are extremely dirty or where considerable water is splashed around the motor. Also, some equipment is located in chemical plants where the atmosphere around the equipment may contain elements injurious to installations.

"In some of these applications a splashproof motor is needed. In others a totally enclosed motor is necessary. In some instances, where ambient temperatures are high, a separately ventilated motor supplied with outdoor air may be necessary.

"When a motor winding burns out, it may be because the motor is overloaded to such an extent that its rating can be questioned. In some cases the maintenance engineer may be fortunate in that the overloaded condition can be detected before a failure occurs.

"Overheating of the motor or tripping of protective relays is generally a flag that the machine may be overloaded. This is assuming, of course, that other factors are satisfactory. Graphic charts taken on such a drive over a period of time should give the complete story.

"If the maintenance engineer gets there before a failure, the operating department can be advised to cut back production until such time as a new motor can be installed or, if a large motor is available, replacement can be made properly.

"The visual inspections are confined to determining if the equipment has accumulated dirt. If it has, the dirt may be blown out with dry compressed air using pressure not exceeding 50 psi.

"Cleanliness cannot be emphasized too highly. Dirt and dust, which can be abrasive, are detrimental to insulation and can clog ventilating ducts in the machine causing excessive operating temperature.

"The operating temperature and, consequently, the life of organic insulating materials depend on proper circulation of air for cooling by convection, together with conduction and heat radiation.

"In many cases dirt or dust combines with oil vapors, carbon dust from brushes, or metallic particles. All of these can be conducting. Such materials provide leakage or conducting paths over the surfaces of insulation or through cracks in insulation. Such leakage paths, unless removed, can eventually cause failures due to flashovers on grounds.

"Visual inspection of the windings does not give the complete answer as to the state of cleanliness, since in many cases the offending dirt or deterioration of insulation may not be visible. An important supplement to visual inspection therefore is the measurement of the insulation resistance. One of the important things gained by such a test is the detection of uncleanliness or deterioration which is not visible to the eye. Such a test also serves as a check on whether cleaning or reconditioning a piece of equipment has been effective.

"Visual inspection of motors will also include all the mechanical features. Some of these items could reasonably be considered as electrical since they are part of the electrical circuit. But, in order to function properly, they must be in good mechanical condition."

Mr. Wohlgemuth outlined the following important parts which should be checked:

A-c motors:

1) Stator windings
    a) General appearance, coil finish condition, and general cleanliness
    b) Coil condition in slots, condition of wedges, and checks for wedge movement, loose wedges, and evidence of coil looseness
    c) Coil condition in end winding, condition and tightness of blocks and spacers, condition and tightness of cord lashing, coil surface condition, condition with respect to possible distortion, compound migration, and insulation swelling
    d) Evidence of corona or slot discharge distress (high voltage machine)
    e) Condition of core, tightness of laminations, cleanliness of ventilating ducts, and heating of finger plates
2) Rotor windings
    a) For synchronous motors check for evidence of movement or shifting of coils, evidence of movement or looseness of poles, general cleanliness, condition of ground insulation washers, connections between coils and to collector, condition of collector insulation, and mechanical looseness of parts
    b) For wound rotor motors check condition of wedges, wedge movement, for loose wedges, for coil looseness, end windage for distortion, end winding blocking and lashing, and rotor banding
    c) For squirrel cage motors check for cracked rotor bars and check end rings for connection to bars
    d) On all larger motors, air gap measurements should be taken periodically and recorded as an indication of bearing wear.

D-c motors:

1) Stator or field
    a) General appearance, field coil condition, and general cleanliness
    b) Coil tightness
    c) Evidence of heating of connections of shunt fields
    d) Evidence of heating of commutating and compensating winding connections
    e) Tightness of current collecting ring and its connections
    f) Check connections between the halves of the field frame
    g) In brush rigging check to see if brushes are free in the holders, if brush tension device is operative and in good condition and set to give proper brush pressure, if brush shunts are in good condition and if the shunt terminals are making good contact where bolted to the brushholders. Check for evidence of brush vibration or chatter. Replace any worn out brushes
2) Armature
    a) Check commutator surface

condition for roughness and smutty appearance and poor color, for eccentricity with dial indicator, and for improper bag edge bevelling, poor mica undercutting and burned bars

b) Check armature condition, especially as to cleanliness.

c) Check for loose wedges

d) Check armature banding

e) Check cross connection joints for tightness

f) Check journals and bearings for wear and high spots, and check oil rings for concentricity and for flat spots.

"An analysis over a considerable number of years of induction motor failures," continued Mr. Wohlgemuth, "shows that bearings contributed to a large percentage. To a lesser extent, this can apply to other types of motors. Therefore proper maintenance and lubrication of bearings is an important item. If a bearing fails, the rotor will rub on the stator and usually give a major repair job.

"Until recent years, the most generally used bearing was the sleeve type. Within the last 10 years or so, the trend has been to the antifriction type, either roller or ball.

"The sleeve bearings still are a must, however, in certain specialized applications, particularly where large shaft diameters are involved and also for use in high speeds. Where a split bearing is required, such as for large heavy rotors, the sleeve bearing is still used.

"Since antifriction bearings operate on entirely different principles than sleeve bearings, it is misleading to make comparisons of the two types or to diagnose the troubles of one type by experiences with the other. The only true comparison is the service obtained over a period of time.

"The antifriction bearing assembly is a self-contained unit made to very close limits and with a high degree of surface finish. Therefore it must be handled carefully and kept free from dirt and corrosive conditions. Motor bearing housings using antifriction bearings must therefore be designed to exclude entry of dirt as much as possible. Careful handling of the bearing during installation and protection from dirt during lubrication are extremely important to trouble-free operation.

"Lubrication of bearings is probably one of the controversial items in the maintenance of motors. It has become so important that most plants now have lubrication engineers who can make recommendations and advise on all problems regarding lubrication. A few essential points should be noted.

"The manufacturer of the equipment recommends the type of lubricant to be used with his product to obtain what he feels to be the best results. These recommendations should be followed unless conditions change.

"Lubrication of sleeve bearings, in general, is accomplished by hand oiling or greasing, depending on the type required. In applications where a large number of motors are concentrated in an area, centralized lubrication is used. This method is more efficient and less expensive than manual lubrication as it distributes the correct amount of lubricant at the proper time intervals. Most motor bearings of the sleeve type, where manual or individual lubrication is performed, have oil rings that carry lubricant from a reservoir onto the shaft. These rings should be checked at periodic intervals to see that they are rotating and thus are carrying the lubricant to the journal and bearing.

"Needless to say, the lubricating oil and the equipment used should be clean. Dust and dirt are enemies of bearings of all kinds.

"An antifriction bearing properly installed and properly lubricated according to its manufacturer's recommendations will give the service desired. But if lubrication periods are neglected, the wrong lubricant used, or dirt permitted to get into the bearing, trouble due to bearing failures is bound to occur. This type of bearing is more susceptible to failures from dirt and incorrect lubrication than a sleeve bearing," Mr. Wohlgemuth concluded. ╪

Air Conditioning Keeps Radar Stations Cool

. . . keeps components running accurately

WHEN America's Vanguard satellite zoomed up to its earth-circling orbit it was tracked by radar so accurate it could call a 6 in. ball hit out of Yankee Stadium "fair" or "foul" from a point 88 miles away.

These atmosphere-piercing radars were operated from tracking stations beneath the rocket's path on the Florida Coast and Grand Bahama Island 165 miles away. Their job was to provide information vitally necessary for successful orbiting of the satellite and to pinpoint the impact areas of the rocket stages.

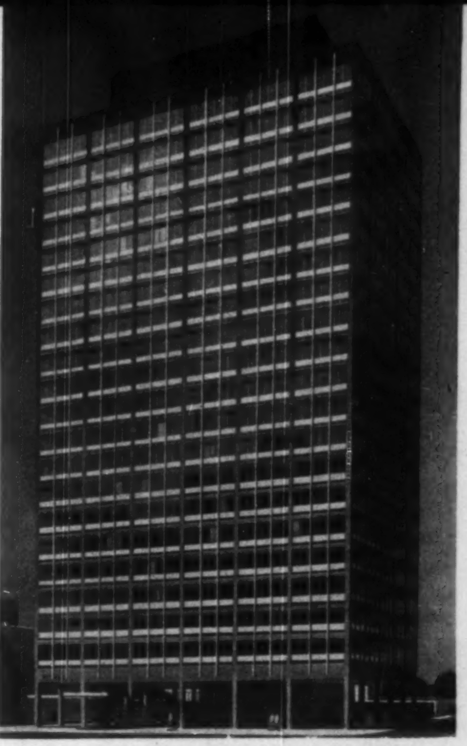
Each tower is protected on all sides by an air conditioned building shielding it from wind and sun which could upset its micrometerlike calculations, according to Carrier Corp.

The cooling job is two-fold. One system is used to cancel the tremendous heat produced by the electronic equipment and the 1000 vacuum tubes—some over 2 ft tall.

The second air conditioning system produces constant temperatures, not just for the comfort of personnel, but to avoid temperature extremes that could offset the minute readings required of the sensitive equipment.

The systems were designed to operate efficiently at altitudes up to 10,000 ft. Special air handling equipment was developed to handle the relatively thin air that exists at these altitudes. ╪

Big Building Air Conditioning Demands Modern Control



. . . for varied temperature, humidity needs

BY JOHN E. HAINES
Vice President
Minneapolis-Honeywell Regulator Co.

FIFTY YEARS AGO buildings were erected as mere shelters to keep out the elements. Very often the stoves and heating systems which served these structures were inadequate and somewhat ineffective.

Today we still build buildings to keep out the elements. But we go a step further. We create an "indoor environment" for living, for working, and for industrial processes. Without the building an environment cannot be created. Without the proper environment, there is no purpose in constructing the building.

Every day the creation of a suitable and adequate environment becomes more important to the comfort, health, and productivity of our people and the efficiencies of industrial processes. When we build office and public buildings, institutions, hotels, apartment buildings, and schools, too often we forget that the end product is people.

The structure itself creates the "visual environment" — the appearance, space arrangement, color, etc. But this is not enough in today's way of life. The indoor environment must include a "thermal environment" and what I prefer to call a "functional environment."

The "thermal environment" includes the heating, ventilating, cooling, and air conditioning.

The "functional environment" includes all of these, and also the lighting, the electrical system, fire alarm system, and telephone system, the elevators, the plumbing, and similar necessary components.

These mechanical and electrical facilities usually cost from 40 to 60 percent of the total cost of the building. And they are space consumers. Yet, too often in the design of a modern building the major attention is given to the visual environment while too little attention is given to the other elements of the total indoor environment. The result is that the mechanical and electrical facilities often cost more than they should and are sometimes less efficient.

In schools and universities the end product is the student. In this case we should design for an "environment for learning." Yet, in my experience, the outside appearance and the cost of the building are too often given the major consideration.

Recognition of the importance of controlled environment is already affecting the design of many types of buildings.

Doctors know that the individual control of the hospital room environment will help a patient recover more quickly. Some patients require warm and humid rooms while others need rooms that are cool and dry.

Educators know that students learn more quickly in environments which are properly controlled. This is particularly true of children, who may learn to read twice as fast in classrooms at 70 F than at 80 F.

Office workers may increase their work outputs by as much as 50 percent under conditions of proper temperature and humidity.

What Is Air Conditioning?

When Dr. Carrier was asked the question "What is air conditioning?" several years ago, he replied, "Air conditioning is the control of the humidity of air by either increasing or decreasing its moisture content. Added to the control of humidity is the control of temperature by either heating or cooling the air, the purification of air by washing or filtering, and the control of air motion and ventilation." The major point expressed in this definition is the control of humidity in the air, and yet

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This article has been based on talks given by Mr. Haines at a conference on designing the indoor climate at the University of California at Los Angeles, a building industry conference at the University of Colorado, and an annual meeting of the Building Research Institute.

how often today is this taken into consideration?

I believe that few of us realize the part that automatic controls play in our daily life and in industry, as well as in the automatic operation of heating and air conditioning equipment. There are thousands of automatic controls available, and there are tens of thousands of automatic control applications in use today. Too, there are literally millions of control combinations which can be used to provide almost any desired result in this automatic world.

In industry, automatic control has had a revolutionary effect. The entire telephone industry, for one example, is largely self-operating. Oil refineries are almost completely controlled automatically.

Underlying all of these developments — from the simple thermostat to the electronic computer which can do a million arithmetical steps in a second — is a single fundamental concept called "feedback". This is the basic principle of all self-regulating systems. Its operation is not rigidly patterned like that of a punch press which comes down every five seconds, whether or not there is a piece of metal under it. What the automatic control does next depends on the results of what it did last.

What Is Feedback?

Feedback can be very simply illustrated by the example of a thermostat set at 70 F that is operating the burner in a heating plant. When the temperature of the room goes below this setting, the thermostat starts the burner to operate. When the temperature rises above this setting, it shuts it off. To make this happen, the thermostat varies its behavior, and that of the burner which it controls, in accordance with the changing information it has received about the room's temperature.

This principle is not a new discovery of the 20th century. Only in the past few years has the theory of feedback been systematically exploited through the use of electronics so that self-regulated machines can be made to work together to the extent that they can operate an entire factory.

As has been said recently, "the pushbutton age, with men pushing buttons that set machinery in motion, has become obsolete. What really marks the 1950's are the buttons that push themselves."

The revolution in the factory is already well under way. Factories that practically run themselves are becoming almost commonplace. To name but a few, canning factories, television and radio assembly plants, light bulb, glassware, and chocolate factories, and breweries are typical examples.

As has also been said, "already we have automatic machines that see better than eyes, calculate more reliably than brains, communicate faster and further than the voice, record more accurately than memory, and act faster and better than hands."

These developments lead to possibilities that are beyond anyone's imagination.

Why are these amazing developments which have no direct relation to heating and air conditioning being discussed here?

First, because the use of adequate automatic control in the telephone industry, the oil refinery, the textile mill, the chemical industry, the paper mill, atomic energy, and now in the manufacture of automobiles is considered a must in order to provide the necessary economy, quality, accuracy, and performance.

Second, because in these machines and processes automatic control is considered so essential that the controls are included in the original design. In many cases the machines and processes are designed *around* the automatic control.

Third, because unfortunately the selection and application of adequate automatic controls for heating and air conditioning are too often not considered as a fundamental part of a heating or air conditioning system from the very beginning of design; too often the heating or air conditioning system is laid out in such a way that it cannot be controlled properly; and too often the heating and air conditioning systems themselves are inadequate to provide for the desired conditions and there is nothing that automatic controls can do about it.

Why Automatic Control?

Just what is the purpose of automatic control for heating and air conditioning?

First, to ensure certain desired or required conditions of temperature and humidity in the most economical manner.

Second, to improve the comfort of human beings. Or better, to eliminate discomfort.

Third, to improve the health and efficiency of human beings.

A considerable amount of research has been conducted to determine the increase in efficiency in human beings in a controlled environment as compared to an uncontrolled environment.

Additional research has been planned by the ASHAE which will permit the reasonably accurate determination of the increase in human efficiency which may be expected from a properly controlled environment.

It is becoming increasingly clear that in the very near future controlled environment will become as important from the standpoint of health and efficiency as it already is from the standpoint of comfort.

It is expected that industry in general, as well as architects, heating and air conditioning engineers and contractors, will find the results of this research very helpful.

The resulting data may enable architects and engineers to design thermal environments for optimum results, and it will undoubtedly increase the demand for air conditioning tremendously.

It seems probable that the ASHAE comfort chart which is so widely used today will become the "comfort, health, and efficiency chart" at some time in the near future.

Today the American Society of Heating and Air-Conditioning Engineers defines air conditioning as follows:

Air conditioning is the process of treating air so as to control simultaneously its temperature, humidity, cleanliness, and distribution to meet the requirements of the conditioned space.

Automatic control is a science. It is essential to the satisfactory operation of any heating and air conditioning system. If automatic controls are to accomplish the purpose for which they are intended, proper analysis and consideration must be given to them from the very conception of the design of heating and air conditioning systems. ‡

Sam
Lewis'
Page

Substitute Individual Heating Plants After Street Steam Was Shut Off

I REMEMBER when the old gas lights and fragile Welsbach mantles gave us the best illumination. I also remember the elation of people when electric lights became available.

The municipal power plants of that bygone era usually had reciprocating engines and direct current generators. Seeking a means to enhance economy, these plants devised a scheme for utilizing the lubricant-laden exhaust steam and selling it to buildings for heating purposes. Until that time each lighting station was crowned with a cloud of waste exhaust steam.

In some cases this steam was converted to hot water which was pumped through pipes under the streets. Central station heating by this means was hailed as a wonderful advance. Soon, systems of this type were installed in Toledo and in Oak Park and Evanston, Ill.

Central steam heating plants—adjuncts of the electric power plants—were installed in Springfield, Bloomington, Champaign-Urbana, and Danville, Ill. Building owners became accustomed to the absence of boiler rooms and chimneys.

As the years flashed by the maintenance of the underground pipes became a burden on the electric companies. Scientific progress in converting fuel to electricity demonstrated the economies to be gained by increased difference between the steam pressures at the engine supply pipe and exhaust pipe.

Nearly 15 psi could be gained if the exhaust could be condensed to subatmospheric pressure immediately after it left the engine. The clean water leaving the meter in each steam heated building—and discharged while hot to the sewer—had to be replaced with additional water at the boilers. This added water had to be demineralized lest the impurities left on the boilers damage them.

To economize, attempts were made to extract all possible heat from the condensate before releasing it to the sewer. (I have installed pipe coils and fan systems where air for ventilating could be warmed by this water. But the pure condensate usually could not get back to the boiler plant for re-use.)

In Danville, Ill., the big, centrally located boiler plant and the underground steam lines grew old. The ancient price schedule was found to be too low. The efficiency of conversion from fuel to electric energy by the old plant proved to be unacceptable compared with the high efficiency of new plants which could apply the exhaust steam immediately. It was no longer wise to accept the tremendous losses in the underground network of obsolescent steam lines.

As a result the Danville electric generating plant was moved several miles to a location where an ample volume of clean water was available. Equally pure boiler feedwater could be added. The downtown generators no longer were operated. The electric company very quickly advised its clients that no more heat would be furnished.

This transition created very little ill will, however, since the company had the foresight to arrange for natural gas to be available from underground storage caves not far away. Similar situations terminating the furnishing of central station heat occurred at Evanston, Oak Park, Bloomington, and Springfield.

After street steam was no longer available, finding space for individual building heating systems and their chimneys required engineering ingenuity in many cases. Some interesting heating arrangements resulted:

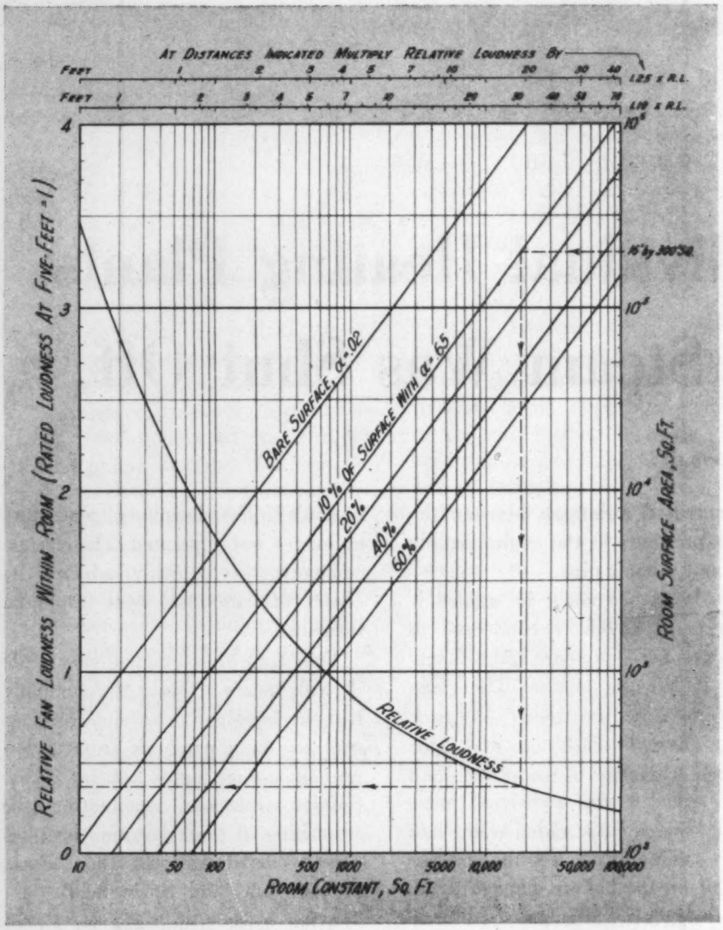
One lofty office building in Danville, about 30 years old, is void of a chimney or boiler room. New gas burning boilers were placed in a fireproof building on an adjacent property. A short metal chimney extends directly above the boilers.

The county courthouse originally was fitted with steam boilers. These were removed and sold when central steam became available. Today, new steam boilers and a vacuum steam circulation system are served by the structure's old, long unused chimney.

The jail has new gas burning boilers and a stainless steel chimney.

Another building with neither chimney nor boiler room has a gas-oil burning boiler on the roof. It thus avoids the necessity of a long chimney through all its floors. ‡

SAMUEL R. LEWIS, *consulting mechanical engineer and a member of Heating, Piping & Air Conditioning's board of consulting and contributing editors, comments informally each month on practical problems in the field.*



2 ROOM EFFECT on fan loudness for wall mounted fans plotted here. Curves present simple means for predicting percentage of increase or decrease of fan loudness within room compared with its rated loudness at 5 ft. (Fig. 1 was in the April issue)

New Method Simplifies Predicting Noise Levels

. . . created by fans, similar equipment

Room noise levels based on internal noise sources have long been difficult to predict due to the complex calculation necessary to arrive at single figure decibel levels—and then the results thus achieved do not give a true indication of noise loudness. In the April issue the author described a new concept to the prediction of noise loudness. Here, he presents some practical examples of how the method works.

BY R. A. GERLITZ
Chief Engineer
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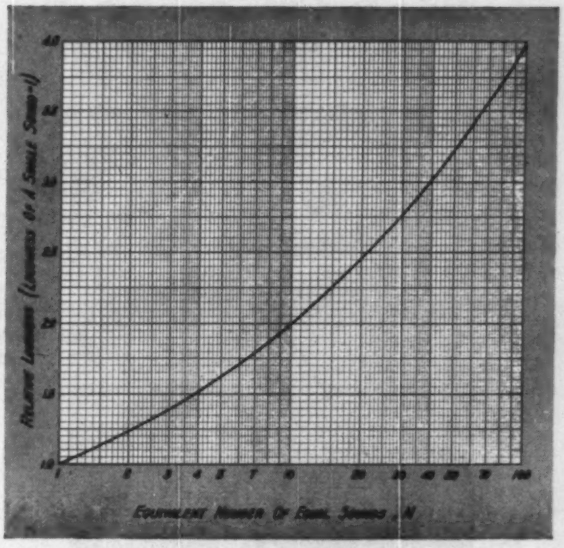


3 AS LOUDNESS of similar noise spectrums are added, total noise increases at decreasing rate. For example, 10 identical noises would be only twice as loud as one

In my article in the April issue it was established that the best way to evaluate noise levels is to consider them in relative terms; i.e., "twice as loud" or "70 percent as loud." Based upon the principles of sound with respect to distance from its source, the calculability of the effect of acoustical insulation, and the result of adding similar sounds together, it is possible to predict what the noise level will be for a given installation. How this is done is described in the following examples.

Example 1

Problem: Determine the room loudness created by 10 ventilating (wall mounted) fans rated at 30 sones installed in a room 16 × 300 × 300 ft with 10 percent of its interior surface treated with sound insulation having an absorption coefficient $\alpha = 0.65$. It is assumed that the sound insulation is more or less uniformly distributed rather than all at one end of the room. Initial room loudness is 45 sones.

Solution: Referring to Fig. 3, $N = 10$ equal noises, since the fans are identical. The relative loudness of 10 fans compared with one fan equals 2. Therefore the total rated loudness of the 10 fans = 2 × 30 = 60 sones.

Referring to Fig. 2, the room surface area is:

Ceiling: 300 ft × 300 ft = 90,000 sq ft
Floor: 300 ft × 300 ft = 90,000 sq ft
Walls: 4 walls × 16 ft × 300 ft = 19,200 sq ft
Total 199,200 sq ft

The room constant = 18,000 sq ft (dotted line in Fig. 2). The relative fan loudness within the room = 0.37, compared with the rated loudness (for room constant = 18,000 sq ft).

The total fan loudness within room = 0.37 × 60 = 22.2 sones, for the 10 fans (excluding initial room loudness). For circulator fans which radiate *all* of their sound energy into the room, multiply this figure by 1.23. Also, for locations very near to the fans multiply by the factors shown in the two scales at the top of Fig. 2.

Referring again to Fig. 3, to add the above fan loudness to the initial room loudness, convert the greater into an equivalent number of the lesser and add. Thus the relative loudness of the room compared with fans = 45/22.2 = 2.03. The equivalent number of 22.2 sone sounds = 10.5, which means that 10.5 noises of 22.2 sones each would be required to produce a loudness of 45 sones.

Adding one equivalent 22.2 sone noise for the loudness of the fans, the total equivalent number of 22.2 sone noises = 10.5 + 1 = 11.5. Therefore the relative loudness overall (room + fans) = 2.09. Final room loudness = 2.09 × 22.2 = 46.5 sones.

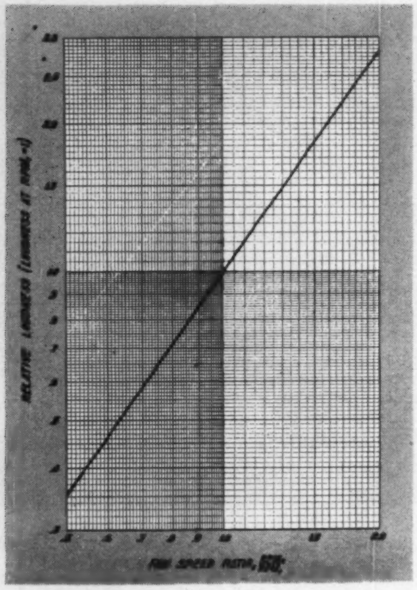
The installation of ten 30 sone fans resulted in only a 3 percent increase in room loudness at distances greater than 25 ft from the fans.

Example 2

Problem: For comparison, assume that the same 10 fans are to be installed in a much smaller room, 10 × 50 × 50 ft, with bare surfaces, $\alpha = 0.02$. The initial room loudness is the same, 45 sones.

Solution: Referring to Fig. 2, the room surface area = 7000 sq ft, the room constant = 143 sq ft for bare surface ($\alpha = 0.02$), and the relative fan loudness within the room = 1.56. Therefore the total fan loudness within room = 1.56 × 60 = 93.6 sones, excluding initial room loudness.

Referring to Fig. 3, to add the fan loudness to the initial room loudness, convert the greater into an equivalent number of the lesser and add, as before. The relative loudness of fans compared with room = 93.6/45 = 2.08, the equivalent number of 45 sone noises = 11.5, the total equivalent number of 45 sone noises = 11.5 + 1 =



4 EFFECT OF CHANGE in fan speed on noise loudness presented here. Chart aids user in determining what decrease in loudness will result from given decrease in fan speed

12.5, and the relative loudness overall (room + fans) = 2.14. Therefore the final room loudness = 2.14 × 45 = 96.2 sones, an increase of 114 percent in room loudness.

The two examples given illustrate quite dramatically the effect of room size and absorptivity on noise within a room. Noises of varying degrees of loudness may also be added by this method. If, in Example 1, a 90 sone fan is installed in addition to the 10 others, it is necessary only to convert it to an equivalent number of 30 sone fans (39) and proceed from there. Instead of ten 30 sone fans we would calculate the effect of 49 fans of 30 sone rating.

Similar results can be obtained without knowing the actual sone ratings if relative figures are assigned. Thus, in Example 1, if the initial room loudness is taken as 1.0 and the rated loudness of one fan as 2/3, the rated loudness of 10 fans would be 2 × 2/3 = 4/3, the total fan loudness within the room would be 0.37 × 4/3 = 0.493, and the final room loudness would be 2.09 × 0.493 = 1.03. As before, an increase of 3 percent is indicated.

A further benefit is to be derived from the "relative loudness" concept of dealing with noise. Frequently it is found that a fan is too noisy and the user desires to know what percent decrease in loudness will result from a given percent decrease in fan speed (and air delivery). Or, when more air is required, how much more noise should be expected? According to the ASHAE Guide, for small changes in fan speed the sound pressure level will change according to the empirical relation:

$$db_2 - db_1 = 50 \log (rpm_2/rpm_1) \quad \text{...........[10]}$$

If this expression for the db change is substituted in Equation 6 and simplified, it will give an expression for the loudness ratio associated with a given speed ratio. Thus:

$$S_2/S_1 = (rpm_2/rpm_1)^{1.5} \quad \text{................[11]}$$

Fig. 4 shows the relation in graphical form. Although the extremities of the curve may not be strictly correct (because they exceed small changes in fan speed), they do give a general indication. The following table, taken from Fig. 4, gives the variation in loudness with fan speed:

Speed ratio, $\frac{rpm_2}{rpm_1}$	Loudness ratio, $\frac{S_2}{S_1}$
1.00	1.00
1.10	1.15
1.25	1.40
1.50	1.84

Frequently, when a group of fans are required in a given situation, the question arises: Which is quieter, a small number of noisy large volume fans or a large number of quiet small volume ones? The answer becomes clear after a bit of mathematical manipulation:

$$\text{Total loudness} = S \times (S_n/S) = SN^{0.3}$$

where:

S = rated loudness of a single fan, sones
N = number of fans required
S_n/S = relative loudness of N fans compared with one fan; equals $N^{0.3}$, from Equation 9.

TABLE 1 — LOUDNESS of typical rooms are compared, where lower limits are "quiet," upper limits are preferred maximums

Room type	Sones
Homes (sleeping rooms)	1½ - 4
Quiet offices, churches, hospitals, libraries	1½ - 5
Industrial offices, drafting rooms, restaurants	5 - 10
Secretarial rooms (typing pools)	10 - 20
Computer room (telephone use difficult)	30
Quiet factory	20
Machine shop	30 - 50
Plating room (fans, polishers, etc.)	40 - 60
Punch press room	70 - 120
Risk of ear damage from extended exposure	200

Now, if a theoretical N is selected for each fan so that the total air volume equals 1000 cfm, the above expression, when computed for each fan, provides a loudness rating on an equal volume basis which may be referred to as the Q factor of the fan. Thus:

$$Q = SN^{0.3} \quad \ldots\ldots\ldots\ldots\ldots\ldots [12]$$

where:

$$N = 1000 \text{ cfm/rated cfm of fan}$$

Select Fans Based on Total Noise

Here then is an entirely new and valuable device for selecting fan types on the basis of total noise. Fan catalog listings showing the Q factor for each fan make possible at-a-glance selection of the quietest model on a total noise, equal volume basis.

The total loudness, S_t, for any given air volume is obtained by:

$$S_t = Q \text{ (total cfm/1000 cfm)}^{0.3} \quad \ldots\ldots [13]$$

where the expression (total cfm/1000 cfm)$^{0.3}$ is equivalent to the $N^{0.3}$ of Equation 9, N in this case representing the number of 1000 cfm volumes (not the same value as the N in Equation 12).

This application is illustrated by the next example.

Example 3

The performance characteristics of four different fans are given below. It is desired to have a noise comparison of them when they are delivering the same total volume of air (108,000 cfm).

Fan	Rated cfm	Sones	N (for 1000 cfm)	$Q = SN^{0.3}$ (sones/1000 cfm)
60 in., 5 hp	54,000	64	0.01851	19.3
36 in., 1 hp	15,200	30	0.0658	13.2
24 in., ¼ hp	5,360	14	0.1864	8.45
60 in., 1 hp	28,400	14	0.0352	5.13

Column $Q = SN^{0.3}$ shows the comparative loudnesses when delivering the same volume of air (theoretically, 1000 cfm). A group of the 60 in., 5 hp fans would be 19.3/13.2 = 1.46 times as loud as a group of the 36 in., 1 hp fans when delivering the same total volume of air (regardless of how much that may be), and 3.76 times as loud as a group of the 60 in., 1 hp fans. The Q factor may be obtained directly from fan manufacturers' catalogs or computed from the loudness and air delivery ratings of the fan, with N representing the theoretical number of fans required to deliver 1000 cfm. Thus, for the first fan listed, N = 1000 cfm/54,000 cfm = 0.01851.

The total loudness, S_t, of a group of fans is given by a simple multiplication per Equation 13. This is as follows:

Fan	No. of fans required	Total cfm (1000)	*(Total cfm /1000 cfm)$^{0.3}$	S_t, total loudness, sones
60 in., 5 hp	2	108	4.07	79
36 in., 1 hp	7	106.4	4.06	54
24 in., ¼ hp	20	107.2	4.06	34
60 in., 1 hp	4	113.6	4.13	21

The factor (total cfm/1000 cfm)$^{0.3}$ may be taken from Fig. 3, if desired, where it represents the relative loudness of N = total cfm/1000 cfm. Note that the *comparative* loudnesses have not changed—the first group of fans still is 1.46 times as loud as the second.

Adjust Fan Speed to Meet Noise Level

Occasionally it is desirable to investigate the feasibility of handling a ventilation job at a given noise level, using a certain model of belt drive fan(s) and adjusting the speed to suit. The problem is simplified if the Q factor at the final speed is known. Using the subscripts 1 and 2 to designate initial and final conditions, respectively, the relations are:

$$S_2 = S_1(\text{rpm}_2/\text{rpm}_1)^{1.5}, \text{ from Equation 11}$$

$$\text{cfm}_2 = \text{cfm}_1(\text{rpm}_2/\text{rpm}_1), \text{ from fan laws, where cfm refers to air delivery rating of fan}$$

$$N_2 = N_1(\text{rpm}_1/\text{rpm}_2), \text{ from the aforementioned stipulation that } \text{cfm}_2 \times N_2 = \text{cfm}_1 \times N_1 = \text{constant} = 1000 \text{ cfm}$$

$$S_2N_2^{0.3} = S_1(\text{rpm}_2/\text{rpm}_1)^{1.5} \; [N_1 \times (\text{rpm}_1/\text{rpm}_2)]^{0.3}$$

$$(SN^{0.3})_2 = (SN^{0.3})_1 \; (\text{rpm}_2/\text{rpm}_1)^{1.3}$$

$$Q_2 = Q_1(\text{rpm}_2/\text{rpm}_1)^{1.3} \quad \ldots\ldots\ldots\ldots\ldots [14]$$

With the aid of Equation 14 the aforementioned investigation can be accomplished quickly and easily. Assume that it is desired to use the 36 in. fans of the previous example to handle the same ventilation job (108,000 cfm) at a total loudness of 35 sones. The fan speed initially is 1140 rpm.

From Equation 13:

$$Q_2 = S_t/(\text{total cfm/1000 cfm})^{0.3} = 35/4.07 = 8.6 \text{ sones/1000 cfm}$$

where:

$$(\text{Total cfm/1000 cfm})^{0.3} = 108^{0.3} = 4.07$$

$$Q_1 = 13.2 \text{ sones/1000 cfm, from the previous example.}$$

Substituting these values in Equation 14:

$$8.6 = 13.2(\text{rpm}_2/\text{rpm}_1)^{1.3}$$

$$\text{rpm}_2/\text{rpm}_1 = 0.70$$

$$\text{rpm}_2 = 1140 \times 0.70 = 799 \text{ rpm}$$

$$\text{cfm}_2 = 15{,}200 \times 0.70 = 10{,}640 \text{ cfm}$$

Therefore the number of fans required would be determined 108,000 cfm/10,640 cfm = 10.15 (or 10) fans. At the cost of three additional fans the noise loudness is reduced by 35 percent.

Errors Due to Variations Not Serious

The relative loudness approach to noise problems has great merit in that it makes it easy to visualize the meaning of noise loudness ratings. The various formulas and charts give one a "feel" for predicting results. Predictions can be just as accurate as with the conventional decibel approach, if the same precautions are observed with respect to the limitations.

Where variations from the specified limitations are not extreme, the errors usually will not be serious. This conclusion is based upon two facts: (1) the loudness functions described represent "average" listeners (but who knows whether a given listener is average?), and (2) the ear has a short memory for precise degree of loudness, thus cannot make "before" and "after" comparisons very closely. ‡

The Law
and Your
Profits

BY WILLIAM HURD HILLYER

Lack of Bond Costly to Contractor

LACK of facilities for securing an acceptable bondsman caused the mechanical (heating, piping, and air conditioning) contractor in the following case three trials, much tribulation, and heavy expense by way of attorney's fees.

Ed U. Cational Construction Corp., a general contractor, was employed by the state building authority for the erection of five school buildings. The subcontractor for installation of heating and ventilating systems in these projects was Hyloe Temperature Co.

Having presumably completed his stipulated work, Henry Hyloe sued Ed U. Cational and its bondsman, claiming an unpaid balance due him of $32,000.

In its answer to the suit Cational sought "equitable relief." It asked that certain other persons be made parties to the action, and stated that only $8900 remained unpaid on the subcontract. Cational tendered this sum into the hands of the court, requesting direction as to whom payment should be made.

Technical moves and countermoves occurred, during the course of which the following facts were set forth:

Hyloe had arranged with one Aidsworth to help him procure a performance bond and to assist him generally in carrying out the subcontract. Pursuant to the agreement, Aidsworth could—under specified circumstances—take over the subcontract from Hyloe and perform it himself on behalf of the general contractor.

During the progress of the work Aidsworth did just that, thereby, it was claimed, becoming the assignee of all of Hyloe's assets growing out of his relationship with the project.

The Cational Corp. contended, as general contractor, that if these facts were true, the case would automatically end in its favor because plaintiff Hyloe would have no interest in the subject matter. Aidsworth had been made a party to the case upon application of Cational.

The trial court referred these allegations to an auditor. His report was favorable to Hyloe and therefore he refused to let the case be thrown out of court.

Cational filed exceptions to the report and moved to recommit. When these exceptions were overruled, Cational brought the case before the state supreme court, which in turn referred it to the state court of appeals.

In a lengthy and closely technical opinion, the higher court took 26 summary positions, among which were, in layman's language:

Cational contended that it had offered to pay Aidsworth the amount which it said was the balance due to the subcontractor. This contention was held "irrelevant and demurrable" because the evidence failed to show that Aidsworth was the subcontractor's agent or assignee.

To the extent that the general contract anticipated the use of subcontractors and regulated their relationships, Cational was bound. That corporation could not, said the court of appeals, defend against a suit to recover the balance due the subcontractor, not having served written notice upon the subcontractor as provided in the subcontract. Neither could Cational set off a claim for service or materials as against the balance on subcontract.

The evidence was deemed sufficient to support the findings of fact made by the auditor. Therefore the lower court's exception thereto was not in error.

It appears without dispute, said the appeals court, that the general contractor's interest was not assigned to the third party Aidsworth. Hence, the contractor's exceptions were "without merit." The court added that all the exceptions of fact were passed on by the trial court upon the theory that his was an action for "equitable accounting."

After careful consideration of the 931 pages of evidence, the court declared that, while the evidence was in sharp conflict as to many of the findings of fact, "all the findings are supported by *some* evidence." The judgment in favor of Hyloe was affirmed on condition that he write off recovery for attorney's fees.

Subcontractor Hyloe might have been spared this thorny litigation—which, despite its favorable outcome, cost him $6000 in attorney's fees—if he had avoided interposing a third party and allowing that party to take over the subcontract under certain circumstances. Necessity of such interposition, it would seem, grew out of Hyloe's lack of financial or other ability in securing a bondsman. ‡

WILLIAM HURD HILLYER, *author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. He has an extensive practical legal and financial background.*

This series presents actual cases. All names are fictitious. It should be remembered that laws vary in different states.

Tear out along this line

How to Make Rough Estimates Of Building Heat Losses

BY MARIO F. MUZZILLO
Professional Engineer

and

BASIL J. CANDELA
Professional Engineer

Muzzillo & Tizian Associates, Consulting Engineers

CONSULTING ENGINEERS often have need for a direct and simple approach to roughly estimating the total heat loss of a building. The chart on the next page can be used to derive these estimates. While the information given should not be used as the final determination of heat loss, it does provide working data which can be applied in lieu of more exacting calculation.

The total heat loss for a building is the sum of wall and glass transmission losses, roof transmission losses, and infiltration and ventilation losses.

The chart derives these losses as follows:

1) Wall and glass transmission losses are obtained from the chart as a function of the area/perimeter factor and fenestration factor (percentage of glass area to gross wall area).

2) Roof transmission losses are obtained as a function of building height.

3) Infiltration and ventilation losses are determined as a function of air changes per hour.

The following example illustrates the use of the chart:

Problem: What is the heat loss, in Btu per hr, for a building 100 ft high × 200 ft long × 50 ft wide, with a 60 percent glass exterior?

Solution: This is calculated:

1) M = area/perimeter
= 10,000/500
= 20

2) Volume = 1 million cu ft

3) From the graph for F = 60 percent and $M = 20$, $B = 2.7$

4) Roof factor = 0.10

5) Assuming one air change per hr, infiltration factor = 1.26

6) The summation of (3), (4), and (5) = 4.06 Btu per cu ft per hr

7) 4.06 Btu per cu ft per hr × 1 million cu ft = 4,060,000 Btu per hr.

The chart is based on a U value of 0.20 Btu per hr per sq ft per F deg for the wall and 1.13 Btu per hr per sq ft per F deg for the glass.

For different glass and wall U values, a corrected value for B may be computed from the graph as per the formula:

$$B' = B_{F\text{-}100\text{ percent}}\,(F)\,(U\text{ glass}/1.13) + B_{F\text{-}0\text{ percent}}\,(1.00 - F)\,(U\text{ wall}/0.20)$$

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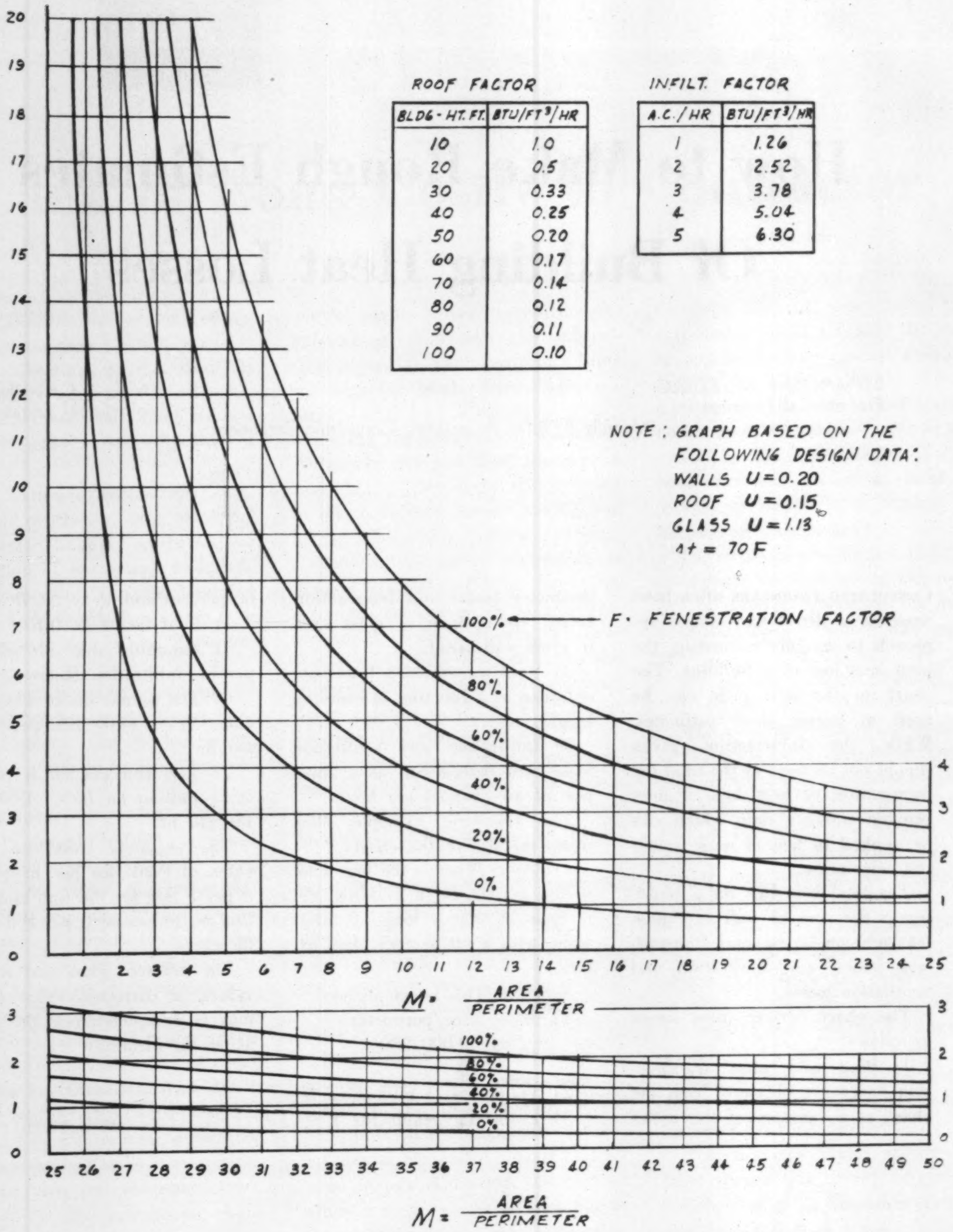

ROOF FACTOR

BLDG - HT. FT.	BTU/FT³/HR
10	1.0
20	0.5
30	0.33
40	0.25
50	0.20
60	0.17
70	0.14
80	0.12
90	0.11
100	0.10

INFILT. FACTOR

A.C./HR	BTU/FT³/HR
1	1.26
2	2.52
3	3.78
4	5.04
5	6.30

NOTE: GRAPH BASED ON THE FOLLOWING DESIGN DATA:
WALLS U = 0.20
ROOF U = 0.15
GLASS U = 1.13
Δt = 70 F

HEAT LOSS for a building is determined by totaling wall and glass transmission losses, roof transmission losses, infiltration and ventilation losses. How to use this chart to find these quantities is explained on preceding page

Heating, Piping & Air Conditioning

JOURNAL SECTION

OF

American Society of Heating and Air-Conditioning Engineers

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Heating, Piping & Air Conditioning, May 1958

President's Message

Evaluation of ASHAE–*ASRE* Merger

I have already outlined on this page the chief features of the proposed ASHAE-ASRE Merger Plan. I would now like to suggest some of the factors which each individual member might well consider in attempting to arrive at his own evaluation of the plan.

For one thing, he might well take into account that the interests of individual members are fully considered. The Merger Plan is expected to permit increased services to each member, and also to provide a sufficiently broad and varied program to insure something for every member. There should be no neglected minority groups.

Then there is the matter of operating savings. The expenses of maintaining headquarters should be lowered without loss of efficiency; all travel costs should be reduced, whether for Officers, the Council, or for committees. Companies who now encourage their engineers to engage in the activities of both Societies will be able to make not only monetary economies of their own, but time economies as well.

This is the age of research. An organization which fails to keep up on research is on a shaky basis. The Merger Plan contemplates not merely the maintenance of present research activities but a greatly expanded scope of program.

Consider too the possibilities of improvements in the committee work which the Merger Plan would make possible. Much work of the greatest importance is accomplished in the many committees through which each society operates. With adoption of the Merger Plan the committees can be unified and strengthened and can apply their efforts in a more concentrated fashion.

A strong feature of the overall program of any engineering society lies in the nature and quality of the papers which its members prepare for presentation before their fellows. No such society is stronger than its national technical meeting program. Realization of the Merger Plan will present an opportunity for not only more but better papers at regular national meetings of the merged society.

And as a parting thought for this month, consider what the Merger Plan can mean to you — and to every other ASHAE member — in enhancing your scope of interest. It could mean that you will have the opportunity of broadening your grasp of the expanded subject matter covered by the merged society, and at the same time be made more fully aware of current practices in the expanded field of interest. There would be more opportunity to meet and talk and exchange views and experiences with a membership not only increased in numbers but augmented in scope as well, while still held together by a bond of mutual professional interest.

E. R. Queer

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from the RESEARCH LABORATORY

This paper is the result of research carried out by the
AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS
at its Research Laboratory located at 7218 Euclid Avenue, Cleveland 3, Ohio

Heat Gain Through Windows Shaded by Canvas Awnings

By Necati Ozisik* and L. F. Schutrum**, Cleveland, Ohio

RESEARCH on the performance of various kinds of awnings in reducing heat gain through windows has been carried out at the ASHAE Research Laboratory under the guidance of the TAC on Heat Transfer through Fenestration† as a part of a continuing program of research to develop design data for heat gain through windows. The awnings to be tested were selected at a meeting attended by representatives of the awning industry, members of the TAC, and members of the ASHAE Research Laboratory staff, and were judged to be typical for the majority of applications. The shape, color, venting characteristics, and specific material of the awning were recognized as the most important factors, and the investigation was directed to determine the relative importance of each of these variables. The percent of window coverage was kept constant in all tests.

SUMMARY — This paper presents results of analytical and experimental investigation of the heat gain through glass windows shaded by canvas awnings. Material, color, shape, and venting of the awnings were recognized as important factors, and the awnings to be tested were selected to permit the evaluation of each of these factors. Experimental results are in satisfactory agreement with the calculated values.

Design data are presented for the transmitted and convected-radiated components of the total heat gain for various hours of the day and for various orientations. Application of the results to determine the shading effect of awnings in excluding solar heat is illustrated.

Test Apparatus

The Calorimeter: Heat gain measurements were made by means of the solar calorimeter essentially as described in an earlier published paper.[1] A general view of the calorimeter with the canvas awning in position is shown in Fig. 1. The apparatus could be rotated to any desired orientation and could be tilted through 90 deg about a horizontal axis. The test window had no setback, and the surface area was $44\frac{1}{4} \times 44\frac{1}{4}$ in. in size. A water and ethylene glycol mixture, the inlet temperature of which could be controlled as desired, was circulated through the tubes inside the calorimeter to absorb the heat gain.

Instrumentation: All temperature measurements were made by means of copper-constantan thermocouples, which permitted taking individual as well as parallel readings to obtain average temperatures.

Measurement of solar radiation was made with 2 Eppley thermo-electric type pyrheliometers, one of which was mounted on the upper face of the panel just above the awning, and the other on the lower face at about 1 ft below the lower edge of the test window. A third pyrheliometer was mounted on the same surface of the panel at the same level as the lower edge of the awning, in order to take measurements of the ground reflected component of solar radiation.

Low temperature radiation received from the sky and the surroundings was measured by a radiometer described in Reference 2.

Wind velocity was measured by a calibrated cup-type anemometer. Two 16-point electronic recorders provided continuous readings throughout the tests.

Awnings and Glasses: The four different awnings selected for testing included:

1. Conventional type, canvas, outside dark green, underside grey-green.
2. Conventional type, canvas, outside white, underside grey.

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*Research Engineer, ASHAE Research Laboratory.

**Research Supervisor, ASHAE Research Laboratory. Member of ASHAE.

†Personnel: R. W. McKinley, Chairman; R. C. Jordan, Vice Chairman; W. J. Arner, T. C. Carson, E. W. Conover, R. B. Crepps, W. B. Ewing, J. E. Frazier, H. F. Kingsbury, J. B. Leavy, Manny Levine, E. C. Miles, Bruno Morabito, F. W. Mowrey, D. J. Vild, H. B. Vincent, O. F. Wenzler, C. J. Youngblood, Jr.

For presentation at the Semi-Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Minneapolis, Minn., June 1958.

[1]Exponent numerals refer to References.

3. Venetian type, canvas, outside dark green, underside grey-green.

4. Conventional type plastic fabric (woven from polyvinylidene chloride monofiliments) outside and inside dark green.

The shape and size of these awnings are given in Fig. 2. The effect of venting the conventional type of canvas awnings was investigated by using standard head-rod clamps and extended head-rod clamps as the positioning devices. The former clamp permitted almost no venting at the top, whereas the latter allowed a ¾-in. opening at the top to vent the hot air trapped under the awning.

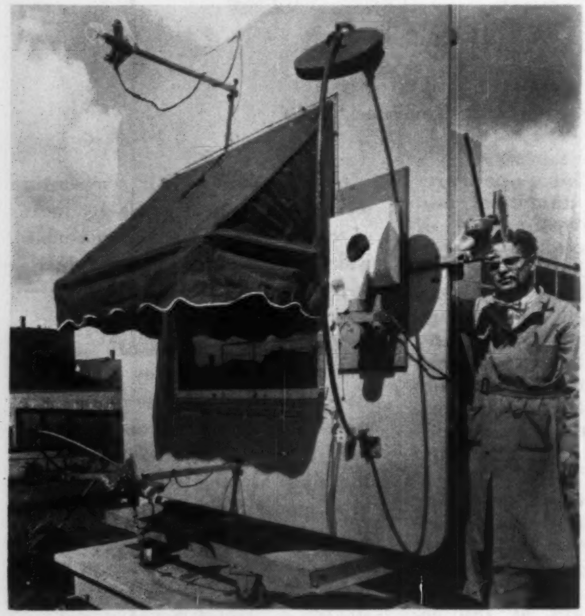
Fig. 1 — View of calorimeter with awning in place

The canvas material was opaque to solar radiation, whereas the loosely woven plastic material permitted a fraction of the solar radiation to pass through it. The quantity of solar radiation passing through the plastic material and falling upon the glass surface was largely a function of the angle of the solar beam with the awning surface. Variation in the transmittance of the plastic material with the incidence angle of an incandescent light beam was determined by pyrheliometer measurements. The transmittance, reflectance, and absorptance of the awning materials obtained from spectral tests and from experiments made at the Laboratory using a pyrheliometer, are shown in Table 1.

The glasses used in combination with the awnings were ¼-in. thick regular plate glass and ¼-in. thick heat absorbing glass.

Test Procedure: Tests were made with the calorimeter in a vertical position for fixed orientation or following the sun. During each of the tests of 20 min duration, data recorded included the altitude of the sun, wall solar azimuth, wind velocity and direction, and condition of the sky in addition to the measurements of temperature and solar intensity. The ground-reflected component of the solar radiation was recorded by the third pyrheliometer which was covered on top in order to shade the pyrheliometer from the solar radiation coming from the sky. The total heat gain of the calorimeter was obtained by computation from the quantity of circulating liquid and its temperature rise, and was corrected for the heat exchanges at the back and side surfaces of the apparatus. The total heat gain thus obtained was the sum of the solar energy transmitted through the glass and the convection-radiation gain from the glass. The transmitted solar energy was computed by subtracting from the total heat gain, the convection-radiation gain, which was obtained from calibration curves based on the temperature of the glass and the temperature of the heat absorbing surfaces of the calorimeter.

Analysis of Problem

Heat Transfer through Windows: A window receives direct solar radiation from the sun, diffuse solar radiation from the sky, reflected solar radiation from the surroundings, and low-temperature radiation both from the sky and the surroundings. If there is no shade of any kind on the window to prevent the sun's direct beam falling upon the glass, a large fraction of direct, diffuse, and reflected solar radiation passes directly through the glass into the room, a smaller fraction is reflected back into the atmosphere, and the remainder is absorbed by the glass. The fraction of solar radiation which passes directly through the glass is hereinafter referred to as the transmitted heat gain. The solar energy absorbed by the glass causes an increase in glass temperature until an equilibrium is reached between the rate of heat absorption by the glass and the rate of heat dissipation from the glass by convection and radiation, both into the room and to the outdoors, with the heat storage in the glass remaining constant at equilibrium. The heat dissipation from the warm glass into the room is hereinafter referred to as the convection-radiation heat gain.

In the presence of an awning which is opaque to solar radiation, if no direct beam falls upon the glass surface, the ground reflected solar radiation entering through the openings of the awning and the diffuse sky radiation from that portion of the sky visible by the glass under the awning form the major portion of the transmitted heat gain.

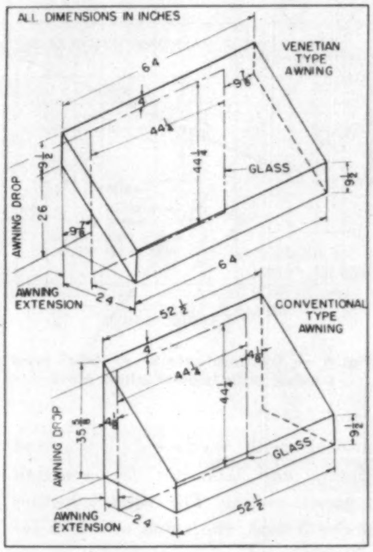

Fig. 2 — Shape and size of awnings tested

If the awning has a high surface temperature, it tends to increase the glass temperature both by radiation and by warming the air under the awning. Therefore, in the presence of the awning, the glass temperature, which controls the convection-radiation gain into the room, is a function both of the awning temperature and the temperature of air under the awning.

The total heat gain into the room through a window is the sum of the transmitted and convected-radiated heat gains. In the following sections, these two components are treated separately.

Transmitted Solar Energy: Consider an awning assembly, in which the awning shades all the glass surface so that no direct beam strikes the glass. Assuming the awning material is opaque, the solar radiation received by the glass is due to the ground-reflected and sky-diffuse solar radiation entering through the openings of the awning and falling upon the glass surface, both directly and after being reflected from the underside of the awning onto the glass. Therefore, for a given awning, the transmitted heat gain is largely a function of the ground reflected component of solar radiation.

A relation between the transmitted heat gain and the ground reflected component of solar radiation was obtained by plotting the transmittance* for awning-glass combinations against (I_{GV}/I_{dV}), where I_{GV} and I_{dV} are the intensity of the ground reflected and the total diffuse solar radiation falling upon a vertical wall having the same orientation as the window. Figs. 3 and 4 show this relation for the conventional and venetian type of canvas awnings respectively in combination with regular plate glass. The solid lines in the figure represent the calculated values, the treatment of which is given in Appendix A. The experimental values fall a little above the calculated line. This is attributed to the fluttering of the side and front flaps of the awning, which exposed a larger opening for the solar radiation falling upon the glass surface.

The canvas material was opaque to solar radiation, whereas, loosely woven plastic material permitted some solar radiation to pass through it. In this case, since the transmittance for awning and glass combinations are dependent upon both (I_{GV}/I_{dV}) and the amount of solar radiation passing through the plastic material, the experimental results could not be expressed in a plot similar to those given in Figs. 3 and 4. However, the additional amount of solar radiation passing through the plastic material and falling upon the glass surface could be computed from the test data.

The foreground immediately in front of the calorimeter was a dark colored platform surrounded by a grass lawn. The effect of variation in foreground on the heat transmitted through the window was investigated by placing a 4 × 8 ft diffusely reflecting white surface in front of the calorimeter. When the sun was not shining on the white surface, its presence made little difference. However, when the direct rays of the sun fell on the area, the transmitted energy was 2 or 3 times as great with the white surface as with the normal foreground.

In order to present design data on the transmitted component of the total heat gain, the HEATING VENTILATING AIR CONDITIONING GUIDE values for the solar radiation intensities for a clear atmosphere at 40 deg North Latitude on August 1 were taken as the basis of design-data calculations. Utilizing the relation given in Figs. 3 and 4 (See Appendix B),

Table 1 — Solar reflectance and transmittance of awning materials

AWNING MATERIAL	NORMAL REFLECTANCE Pyrheliometer[a] Measurements	NORMAL REFLECTANCE Spectral[b] Measurements 0.3—2.1 Micron
CANVAS		
Dark green		
Outer surface (dark green)	0.21	0.22
Inner surface (grey green)	0.32	...
Silver blue (outer surface)	0.27	0.25
Green (outer surface)	...	0.36
Dusty rose (outer surface)	...	0.37
Silver rose (outer surface)	0.41	0.40
White		
Outer surface (white)	...	0.91[c]
inner surface (grey)	0.53	...
PLASTIC		
Dark green (both sides)	0.27	...
Blue (both sides)	0.32	...
Red (both sides)	0.34	...
AWNING MATERIAL	TRANSMITTANCE	
CANVAS	Zero	
PLASTIC		
Direct solar radiation	0.25 normal	
Diffuse solar radiation	0.15	

[a] Reflectances compared with white sample in sunlight.

[b] Spectral values from Electrical Testing Laboratories, Inc. (0.45-1.25 micron) extended to (0.3 to 2.1 micron).

[c] For design data 0.80 was used to allow for weathering.

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*Solar energy transmitted per unit area of the glass surface expressed as fraction of the intensity of total diffuse solar radiation falling on a vertical wall having the same orientation as the window.

transmitted heat gains were calculated for conventional and venetian type canvas awnings and conventional type plastic awnings in combination with regular plate glass. These data are tabulated in Table 2A for East, South, and West orientations and for various hours of the day during which the awning prevents the direct sun from falling upon the glass. It is, however, to be noted, that transmitted heat gains given in this table are for a rather dark foreground. For a light foreground, the transmitted heat gains for canvas awnings will be about twice those given in Table 2A. For the conventional type plastic awning, an amount equal to the transmitted heat gain for the conventional type canvas awning with a dark foreground should be added.

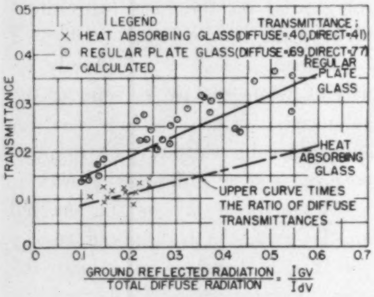

Fig. 3 — Transmittance of conventional type awning in combination with regular plate and heat absorbing glass

Convection and Radiation Heat Gain: By writing the basic heat balance equations for the glass and awning, as shown in Appendix C, the convection-radiation heat gain from the glass into the room was related to the outside air temperature and the amount of heat absorbed by the awning and glass. The convection-radiation heat gain obtained from this relation for a 75 F indoor temperature was plotted in Fig. 5 against a term which is the sum of the outdoor air temperature, one third of the solar heat absorbed per unit area of the glass, and a fraction (determined experimentally) of the solar heat absorbed per unit area of the awning. For wind velocities of 2½ to 5 mph, this fraction was approximately 0.10 for conventional type canvas awning with standard-head-rod clamp, 0.07 for the conventional type canvas awning with extended-head-rod clamp, and 0.05 for the venetian type of awning. For wind velocities above 5 mph, the value was 0.05 for all awnings.

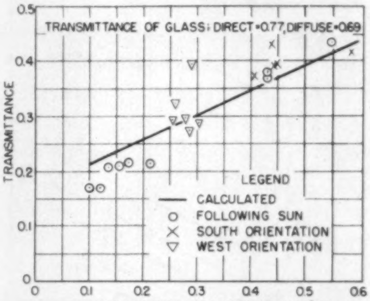

Fig. 4 — Transmittance of venetian type awning with regular plate glass

The experimental data for the convection-radiation heat gains, after be-

Table 2—Design data on heat gain[a] through awning-glass combinations for 75F indoor temp.

			Table - 2A			Table - 2B					Table - 2C					Table - 2D		
			Heat Gains With Awnings													Total Heat Gain Glass Only		
			Transmitted			Convection—Radiation					Total Gain							
						Awning Type Used										Type Glass		
			Conventional		Venetian	Conventional				Venetian	Conventional				Venetian	Reg. Plate (b)	Ord. Window (c)	Heat Absorb. (d)
			Canvas	Plastic	Canvas	Canvas			Plastic	Canvas	Canvas			Plastic	Canvas			
						Green	Green	White	Green	Green	Green	Green	White	Green	Green			
						Type Head Rod Clamp					Type Head Rod Clamp							
Orientation	Sun Time	Outdoor Temp., F				Standard	Extended				Standard	Extended						
EAST	7AM	75	6+9[e]	31+9[e]	9+8[e]	13	9	4	8	8	28	24	19	48	25	183	199	135
	8	77	8	38	11	17	13	6	12	12	25	21	14	50	23	192	211	142
	9	80	9	37	11	21	17	9	16	15	30	26	18	53	26	172	187	129
	10	83	9	30	12	24	19	12	18	17	33	28	21	48	29	124	137	94
	11	87	10	22	12	26	22	16	20	20	36	32	26	42	32	67	71	54
	12	90	9	13	10	26	22	18	21	21	35	31	27	34	31	32	33	27
SOUTH	8AM	77	6	10	7+4[e]	10	10	4	7	7	16	16	10	17	18	19	20	14
	9	80	7	16	9+6[e]	16	13	8	10	11	23	20	15	26	26	44	48	34
	10	83	9	21	11+2[e]	21	18	12	16	16	30	27	21	37	29	73	78	57
	11	87	9	24	11	27	23	16	21	21	36	32	25	45	32	96	104	75
	12	90	10	29	12	30	26	19	25	25	40	36	29	54	37	107	115	84
	1PM	93	9	24	11	34	30	23	28	28	43	39	32	52	39	103	110	82
	2	94	9	21	11+2[e]	34	30	23	28	28	43	39	32	49	41	85	90	69
	3	95	7	16	9+6[e]	33	29	24	26	27	40	36	31	42	42	59	63	50
	4	94	6	10	7+4[e]	28	26	21	24	24	34	32	27	34	35	36	37	32
WEST	12	90	9	13	10	26	23	18	21	21	35	32	27	34	31	32	33	27
	1PM	93	10	22	12	33	29	22	27	27	43	39	32	49	39	73	77	61
	2	94	9	30	12	37	32	24	30	29	46	41	33	60	41	136	147	107
	3	95	9	37	11	39	34	25	32	31	48	43	34	69	42	189	204	148
	4	94	8	38	11	36	32	24	31	30	44	40	32	69	41	210	228	164
	5	93	6+9[e]	31+9[e]	9+8[e]	33	29	22	28	27	48	44	37	68	44	202	217	157

NOTE: Data obtained from a 44 in. square regular plate glass window facing a dark foreground and shaded by an awning having a drop of 70 percent.
Values calculated for a combined outside conductance of 3 Btu per (hr) (sq ft) (F).

[a] All heat gains are in Btu per (hr) (sq ft).

[b] Regular plate glass, with transmittance for direct-solar radiation (normal) 0.77.

[c] Ordinary window glass, with transmittance for direct-solar radiation (normal) 0.87.

[d] Heat absorbing glass, with transmittance for direct-solar radiation (normal) 0.41.

[e] Addition due to direct sun on the glass.

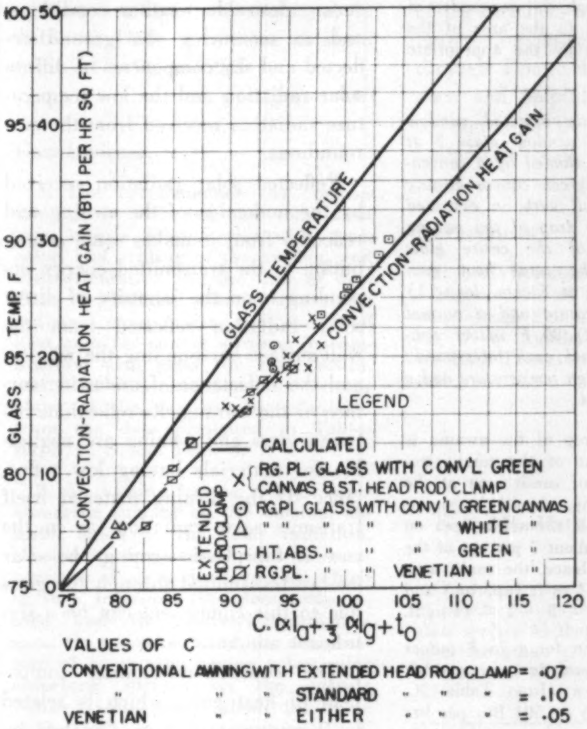

Fig. 5 — Convection-radiation heat gain and glass temperature (for 75 F indoor temperature)

Table 3—Sunlit area on the lower-section of the glass as percentage of the entire glass surface

Orientation	Sun Time		Conventional			Venetian		
			Awning Drop			Awning Drop		
			0.65	0.60	0.55	0.65	0.60	0.55
SOUTH	7 AM	5	..	..	..	..	..	..
	8 ↓	4 ↑	4	8	13	7	14	22
	9	3	2	4	7	5	11	18
	10	2 PM	..	2	5	2	5	7
EAST ↓ WEST ↑	7 AM	5	7	13	22	7	13	22
	8 ↓	4 ↑	..	7	15	..	7	15
	9	3 PM	..	..	..	..	..	..

NOTE: Based on 3 FT × 5 FT window, awning extension 5 in. & 10 in. for conventional and venetian type awnings respectively.

ing adjusted to a 75 F indoor temperature, are in satisfactory agreement with the calculated curve as shown in Fig. 5. Values from this curve were used for calculating the design data for convection-radiation heat gains. For these design-data calculations, the outdoor air temperatures and the solar radiation intensities were taken the same as those given in THE GUIDE for a clear atmosphere at 40 deg North Latitude on August 1. The convection-radiation design data thus calculated for the awnings in combination with regular plate glass are given in Table 2B, for East, South, and West orientations and for various hours of the day.

Application of Data: The total heat gain through a window shaded by an awning is the sum of the transmitted and the convected-radiated heat gains. The total heat gains thus obtained, for the window and awning combinations tested, are given in Table 2C. These values are considered to be correct to within ± 2 Btu per (hr) (sq ft).

It should be noted that the heat gain values in Table 2C are strictly applicable only to the glass-awning combinations tested. The test window was 44¼ in. square, and all of the test awnings had drops* of approximately 70 percent. However, by making the corrections described later, the values in Table 2 may be applied with reasonable accuracy to other awning-shaded windows.

Within reasonable limits, the width of a window does not appreciably alter the total heat gain values given in Table 2C.

As just indicated, Table 2 has been prepared for a window shaded by an awning having a 70 percent drop. If the awning drop is less than 70 percent, sunlit glass areas may exist in the lower section of the window, which have not been accounted for in Table 2. The height of this *lower section* is equal to the total glass height −1.4 × awning drop in feet. The sunlit area, if any, in the *lower section* can be estimated from the data in Table 3. This table gives the

Table 4 — Heat exclusion by awnings[a]

Orientation of Window	Type of Glass and Awning[b]	Heat gain per 100 sq ft glass surface, Btu/Day	Heat Excluded by the Awning	
			Btu/Day	Percent
South[c]	Regular plate glass alone	62200	0	0
South	Glass with conventional type white canvas awning	22500	39700	64
South	Glass with conventional type green canvas awning	27700	34500	55
South	Glass with conventional type dark green plastic awning	35600	26600	43
West[d]	Regular plate glass alone	84200	0	0
West	Glass with conventional type white canvas awning	19500	64700	77
West	Glass with conventional type green canvas awning	23900	60300	72
West	Glass with conventional type dark green plastic awning	34800	49400	59

[a] Data are for a window facing a dark foreground, an awning having a 70 percent drop, and for a typical design day (Aug. 1) at 40 deg. North Latitude.
[b] Awnings mounted with extended-head-rod clamps.
[c] For period from 8 a.m. to 4 p.m.
[d] For period from 12 noon to 5p.m.

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*Fraction of the height of the window covered by the awning (see Fig. 2).

sunlit area in the lower section of a 3 × 5 ft window for 3 orientations, 3 different awning drops, and for various times of the day. The data may be applied to windows of other dimensions without serious error.

If the foreground is of light color, the total heat gain in Table 2C should be increased by an amount approximately equal to the transmitted component of heat gain given in Table 2A for the type of canvas awning under consideration. The additional gain for a plastic awning is the same as for a similar canvas awning.

The data in Tables 2B and 2C are for an inside temperature of 75 F, and for outside temperatures as indicated in the table for different hours of the day. For temperature differentials other than those used in the table, the data may be corrected by adding or subtracting 1 Btu per (hr) (sq ft) for each degree of increase or decrease in temperature differential.

The data in Table 2 are for regular plate glass windows. However, the values can be applied with only small error to awnings in combination with ordinary window glass (data in Table 2C are about 1 to 3 percent low for ordinary window glass).

It was found that the total heat gains given in Table 2C could also be used for heat absorbing glass in combination with awnings provided the sunlit portion of the glass is not large. The reduced transmitted gains through the heat absorbing glass were largely offset by the convection-radiation gains resulting from higher glass temperatures.

The total heat gain through a window shaded by an awning having less than a 70 percent drop may, therefore, be determined by adding the 2 components of the gain which may be calculated as follows:

1. Heat gain through sunlit glass in the lower section of the window is equal to the sunlit glass area multiplied by the appropriate value from Table 2D.
2. Heat gain through the remainder of the window is equal to the area of the remainder multiplied by the appropriate value from Table 2C.

Example:—A southerly oriented window having an ordinary window glass 3 ft wide × 5 ft long is shaded by a conventional type of dark green canvas awning positioned to the wall with an extended head-rod clamp. The drop of the awning covers 55 percent of the entire glass height. Calculate the total heat gain through the window at 3 p.m. for: (1) *75 F indoor temperature and a normal dark foreground;* (2) *80 F indoor temperature and a normal dark foreground;* (3) *80 F indoor design temperature and a light color foreground.*

Solution:—As the drop of the awning is less than 70 percent of the total glass height, the amount of sunlit area at the lower section, if any, should be determined. From Table 3, the sunlit area on the lower section is about 7 percent of the total glass surface. Hence, the sunlit area = 3 × 5 × 0.07 = 1 sq ft (approx.) and the shaded area = 3 × 5 − 1 = 14 sq ft.

(1) Total heat gain for a 75 *F indoor temperature and normal dark foreground*: For the shaded area (from Table 2C, column 2): 14 × 36 = 504 Btu per hr; for the sunlit area (from Table 2D, column 2): 1 × 63 = 63 Btu per hr; total heat gain through the entire glass surface = 567 Btu per hr.

(2) Total heat gain for an 80 *F indoor temperature and normal dark foreground*: The air temperature difference for this example is 95 − 80 instead of the 95 − 75 differential on which Table 2 values for 3:00 p.m. is based. Allowing 1 Btu per (hr) (sq ft) correction per Fahrenheit degree difference in temperature differential, the reduction in the heat gain is 15 × 5 = 75 Btu per hr. Hence the total heat gain is 567 − 75 = 492 Btu per hr.

(3) Total heat gain for an 80 *F indoor design temperature and a light color foreground*: The additional heat gain due to the increase in the transmitted component of the heat gain, as taken from Table 2A, column 1, is 7 Btu per (hr) (sq ft). Hence the total heat gain is 492 + 7 × 15 = 597 Btu per hr.

Discussion of Results

The mathematical analysis of the transmitted and convected-radiated components of the total heat gain through canvas-awning-shaded windows is in fairly good agreement with the experimental data, considering the difficulty experienced in securing desirable weather conditions, and in measuring the ground reflected and sky components of diffuse solar radiation and the low temperature radiation received from the surroundings.

Reflected solar radiation received by the underside of the awning and reflected from it makes some contribution to the transmitted energy depending upon the intensity of direct solar radiation reflected from the wall surface surrounding the window and the reflectance of underside surface of the awning. Re-reflections between glass and awning are negligible for materials having low reflectance. If the awning material itself transmits solar radiation, as in the case of the plastic awning, the solar energy transmitted through the glass due to this component can be a significant amount.

The convection-radiation component of heat gain, which is related to the amount of heat absorbed by the awning and glass, the outdoor temperature, and the venting characteristics of the awning, calculated for a combined outside convection-radiation conductance of 3 Btu per (hr) (sq ft) (F), correlates well with test data as shown in Fig. 5. The limitation to the general application of this relation to all kinds of awnings is the necessity of determining experimentally the constant C appearing in the abscissa of Fig. 5. This constant depends on the venting of the awning. The conventional type of canvas awning with the standard-head-rod clamp and the venetian type of awning may represent the 2 extremes in the venting of canvas awnings. Furthermore, at wind velocities above 5 to 6 mph, the warm air under the awning is carried away by the wind. For awnings having low solar absorptance on the outer surface, venting is not important.

To illustrate the order of magnitude of the solar heat excluded by an awning over a period of a day, the total heat gains through 100 square feet of regular plate glass with and without awnings, are compared in Table 4. These data were obtained from Tables 2C and 2D.

Conclusions

1. The performance of canvas awnings in reducing the total heat gain into a room varies with type, color, and venting of the awning, and with orientation and the time of day. The transmitted and convected-radiated components and the total heat gain for canvas awnings in combination with glass for East, South, and West orientations and for various hours of the day can be calculated from the data presented in Tables 2A, B, C, D, and Table 3.

2. An awning having a high solar absorbing surface on the outside, absorbs much of the solar radiation, causing its temperature and the temperature of air under it to rise, which in turn increases the glass temperature and the convection-radiation gain. On the other hand, the temperature of an awning having a low solar absorbing surface on the outside (white) will remain about the same as the outdoor air temperature. Thus, air under the awning is not appreciably heated and venting of such an awning is not important.

3. For wind velocities above 5 to 6 mph, venting of the awning is not important.

4. A light foreground in the presence of direct sunlight may approximately double the transmitted gain for a canvas awning-glass combination. For a plastic awning, the increase is approximately equal to the increase in transmitted gain for a canvas awning.

5. The use of heat absorbing glass instead of regular plate glass in combination with awnings causes only a few Btu per (hr) (sq ft) reduction in the total heat gain, provided the sunlit portion of the glass is not large.

6. Over that period of a day during which an awning prevents the direct sun from falling upon the glass, on a southern exposure, 55 to 65 percent of the heat gain through the window is excluded by a canvas awning, and on a western exposure, the saving is 72 to 77 percent.

Acknowledgment

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APPENDIX A

Solar Radiation Falling Upon the Glass Surface Under the Awning

Consider an awning and glass assembly, in which the awning shades all of the glass surface so that no direct beam falls upon the glass, and the awning material is opaque to solar radiation. The solar radiation received by the glass surface is largely due to the following components:

1. Ground-reflected and sky-diffuse solar radiation entering through the openings of the awning and falling upon the glass surface.
2. Ground-reflected and sky-diffuse solar radiation entering through the openings, and after being reflected from the underside surface of the awning, falling onto the glass surface.
3. Solar radiation reflected from the wall surrounding the window onto the underside of the awning, and in turn from the awning onto the glass.

The amount of re-reflected radiation between the glass and awning was relatively small, and was considered negligible.

In order to evaluate the foregoing quantities, the glass surface was arbitrarily divided into 2 sections:

Section 1: Glass surface above the lower edge of the awning.

Section 2: Glass surface below Section 1.

The amount of solar radiation falling upon each section was calculated in the following manner:

(*a*) Solar radiation falling upon Section 1 of area (A_1) consisted of the following components:

1. Ground-reflected solar radiation entering through the lower opening of area (A_5), $I_{GV}A_5 F^*_{5-1}$.
2. Diffuse radiation from the sky entering through the top opening of area (A_6), $I_{SV}A_6F_{6-1}$.
3. Diffuse solar radiation both from the sky and that reflected from the ground entering through the side opening of area (A_7), $(I_{GV} + I_{SV})\ A_7\ F_{7-1}$.
4. Diffuse solar radiation entering through the lower, top and side openings and falling upon

Nomenclature

A = surface area, square feet.

C = constant used in determining convection-radiation heat gains (Fahrenheit) (hour) (square foot) per Btu.

CR_{gi} = convection-radiation heat gain from the glass into the room, Btu per (hour) (square foot).

E = Stefan-Boltzmann constant multiplied by the temperature of the surface in Fahrenheit degree absolute to the fourth power, Btu per (hour) (square foot).

F = shape factor, dimensionless.

h_c, h_r, h_{cr} = surface conductance for convection, radiation, and convection-radiation, Btu per (hour) (square foot) (Fahrenheit degree).

H = mixing coefficient, Btu per (hour) (Fahrenheit degree).

I_{aV}, I_{DV} = intensity of total diffuse and direct solar radiation, on a vertical surface, Btu per (hour) (square foot).

I_{SV}, I_{GV} = intensity of sky-diffuse and ground-reflected solar radiation on a vertical surface, Btu per (hour) (square foot).

I_{aH}, I_{DH} = intensity of total diffuse and direct solar radiation on a horizontal surface Btu per (hour) (square foot).

I_{DN} = intensity of direct solar radiation normal to the sun beam, Btu per (hour) (square foot).

aI_a, aI_g = solar energy absorbed by the awning and glass, Btu per (hour) (square foot).

t = temperature, Fahrenheit.

t'_o = temperature of air under the awning, Fahrenheit.

R = reflectance, dimensionless.

T = transmittance, dimensionless.

β = altitude of sun above a horizontal plane, degrees.

Subscripts

i, o — refer to inside and outside.

a, g — refer to awning and glass.

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*Shape factors in Appendix A are all for a quarter sphere.

the underside of the awning of area (A_4), from where it is reflected onto Section 1 of the glass, $[I_{GV} A_3 F_{3\text{-}4} + I_{SV} A_6 F_{6\text{-}4} + (I_{GV} + I_{SV})\, A_7 F_{7-4}]\, R_4 F_{4\text{-}1}$.

(b) Solar radiation falling upon Section 2 of area (A_2) consisted of the following components:

1. Diffuse solar radiation from the sky and reflected solar radiation from the ground, $[I_{GV} + I_{SV}\,(1 - F_{2-3})]\, A_2$.
2. Diffuse solar radiation reflected from the underside of the awning of area (A_4), $[I_{GV} A_3 F_{3-4} + I_{SV} A_6 F_{6-4} + (I_{GV} + I_{SV})\, A_7 F_{7-4}]\, R_4 F_{4\text{-}2}$.

Furthermore, the underside of the awning received solar radiation reflected from the wall surface surrounding the window, which, in turn was reflected onto the entire glass surface. This was

$$(I_{DV} + I_{dV})\;R_{\text{wall}}\;A_4 F_{4-\text{wall}}\;R_4 F_{4-(1+2)}$$

The sum of the foregoing components of solar radiation represents the total diffuse solar radiation falling upon the entire glass surface. The solar energy transmitted through per unit area of the glass surface was obtained by dividing this sum by the area of the glass surface and multiplying it by the transmittance of glass for diffuse solar radiation.

APPENDIX B

The Ground-Reflected Component of Solar Radiation

Intensity of the ground-reflected solar radiation falling upon a vertical surface depends largely upon the intensity of solar radiation on the foreground and the reflectance of the foreground. The intensity of solar radiation on a horizontal foreground irradiated by the sun is ($I_{dH} + I_{DN}\,\text{Sin}\beta$).

From the pyrheliometer measurements of the ground reflected solar radiation falling upon the vertical surface, it was found that, for the usual dark surroundings in front of the calorimeter, (I_{GV}) correlated approximately with the following relation:

$$I_{GV} = 0.06\,(I_{dH} + I_{DN}\,\text{Sin}\beta)$$

This relation was then used in computing the ratio (I_{GV}/I_{dV}), for calculations of the transmitted component of the heat gain. The values of I_{dH}, I_{DN}, I_{dV}, and β were taken from THE GUIDE.

APPENDIX C

Convection-Radiation Heat Gain from the Glass into the Room

Equating the rate of solar energy absorbed per unit area of glass surface to the convection-radiation losses from the same surface:

$$\begin{aligned} aI_g = {} & CR_{gi} + h_{co}\,(t_g - t'_o) \\ & + h_{ro}\,(t_g - t_a)\,F_{g\text{-}a} \\ & + h_{ro}\,(t_g - t_o)\,(1 \\ & - F_{g\text{-}a}) \quad \ldots\ldots\ldots.(\text{C-1}) \end{aligned}$$

where

CR_{gi} = the convection-radiation gain from the glass into the room.

Writing a similar heat balance equation for the awning:

$$\begin{aligned} aI_a = {} & h_{co}\,(t_a - t_o) + h_{co}\,(t_a \\ & - t'_o) + h_{ro}\,(t_a - t_o) \\ & F \quad \ldots\ldots\ldots\ldots\ldots.(\text{C-2}) \end{aligned}$$

where

$$F = 1 + F_{a\text{-}1} + F_{a-\text{opening}}$$

For the purpose of this equation, the temperatures of the glass and the surroundings were assumed to be equal to the temperature of the outside air, t_o.

Solving for t_a in Equation C-2 and substituting in Equation C-1,

$$\begin{aligned} \left(\frac{1}{h_{cro}}\right)(CR_{gi}) + t_g = {} & \frac{1}{h_{cro}}\,\alpha I_g + \left[\frac{h_{ro}F_{g-a}}{h_{cro}(2h_{co} + Fh_{ro})}\right]\alpha I_a \\ & + t_o\left(\frac{h_{ro}}{h_{cro}}\right)\left[1 - \frac{h_{co}F_{g-a}}{2h_{co} + Fh_{ro}}\right] \\ & + t'_o\left(\frac{h_{co}}{h_{cro}}\right)\left[1 + \frac{h_{ro}F_{g-a}}{2h_{co} + Fh_{ro}}\right] \cdots\cdot(\text{C-3}) \end{aligned}$$

where, $h_{cro} = h_{co} + h_{ro}$

Taking the combined convection-radiation conductance*, h_{cro} as 3 Btu per (hr) (sq ft) (F deg) and the radiation conductance‡, h_{ro} as 1.2 Btu per (hr) (sq ft) (F deg), and substituting the numerical values of the shape factors, Equation C-3 may be reduced to the following form for conventional type awnings:

$$\begin{aligned} 1/3\;CR_{gi} + t_g = {} & (0.05\;aI_a + 1/3 \\ & aI_g) + (1/3\;t_o \\ & + 2/3\;t'_o \;..(\text{C-3a}) \end{aligned}$$

In this equation, other conditions being the same, t'_o is a function of the rate of removal of the hot air collected under the awning. Assuming that the air under the awning receives heat by convection from the awning only, and that this heat is carried away by air circulation only, the heat balance Equation C-4 can be written:

$$A_a\,h_{co}\,(t_a - t'_o) = H\,(t'_o - t_o) \quad (\text{C-4})$$

where H is determined from the test data. t'_o was solved by eliminating t_a from Equations C-2 and C-4. Substituting the value of t'_o thus obtained in Equation C-3a and putting in the respective values of the constants, Equation C-3a becomes as follows:

$$\begin{aligned} 1/3\;CR_{gi} + t_g = {} & (C\;aI_a + 1/3\;aI_g) \\ & + t_o \;\ldots\ldots(\text{C-3b}) \end{aligned}$$

The value of C was found to vary with the type of awning, the type of head-rod clamp, and the wind velocity. Values determined from experimental results, are as follows: For conventional awnings and wind velocities up to approximately 5 mph, C equals 0.07 and 0.10 for extended and standard type head-rod clamps respectively. For wind velocities above 5 mph, $C = 0.05$ for either type of head-rod clamp. For venetian type of awnings, a value of 0.05 may be used for any wind velocity and any type of head-rod clamp. Although weather conditions permitted the collection of only a few data at wind velocities below 2 mph, it is believed that the values may be applied without serious error for such conditions.

From Reference 3,

$$\begin{aligned} CR_{gi} = {} & 0.27\,(t_g - t_i)^{0.25}\,(t_g - t_i) \\ & + 0.938\,(E_g - E_i) \;..(\text{C-5}) \end{aligned}$$

From Equations C-3b and C-5, the convection-radiation gains were calculated for an inside design temperature of 75 F, and were plotted in Fig. 5 as a function of the right hand term of Equation C-3b.

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*Calculated values based on $h_{cro} = 3$ agreed well with experimental values.

‡For the temperature ranges encountered during the tests for the glass and awning, and taking into consideration the emissivities of these surfaces, an average value 1.2 Btu per (hr) (sq ft) (F deg) was taken for the radiation conductance.

EJC Policy Statement[†] *on*

Air Pollution and its Control

The engineering profession, through its Engineers Joint Council, has developed the following policy principles for consideration by those concerned with air pollution and its control.

1. The common goal is to maintain a reasonable degree of purity of our air consistent with:

- *a.* the public health and welfare and public enjoyment thereof
- *b.* the continued industrial development of our country
- *c.* the protection of plant and animal life
- *d.* the protection of physical property and other resources

2. Air pollution means the presence in the outdoor atmosphere of one or more contaminants, such as dust, fumes, gas, mist, odor, smoke, or vapor, in quantities, of characteristics, and of duration such as to be injurious to human, plant or animal life or to property, or which unreasonably interfere with the comfortable enjoyment of life and property.

3. In the development of criteria for the control of air pollution, it must be recognized that although the atmosphere is a medium suitable for the disposal of waste products, true conservation requires that the public interest be protected against excessive and unsafe use of the atmosphere for this purpose.

4. Effective criteria are required to serve two purposes, namely, enforcement and protection of the public interest. The first of these can be most effectively accomplished at the points of emission, the second at the points of use. Sound criteria must give relative evaluation of these two measures.

5. In the development of standards, plans, rules or regulations, due consideration must be given to local conditions, such as topography, meteorology, industrial development, and area planning.

6. Emphasis should be placed upon education and voluntary cooperation by all persons and organizations who may contribute to air pollution or who are interested in its control. Encouragement should be given to groups or associations of municipalities, industries, or other groups, who severally or jointly can be of help in planning its effective abatement.

7. Laws with appropriate penalties may be necessary, but their use should be reserved for cases where cooperation and voluntary action do not prevail.

8. During an emergency, such as may develop under adverse meteorological conditions, short-time curtailment of community and industrial activities which contribute to pollution may be necessary. Although such an emergency condition is seldom encountered, it is essential that duly constituted governmental authority anticipate such a problem, and be prepared to act through a prearranged procedure.

9. The objective of air pollution control legislation is to recognize the right to the use of the air and the responsibility to avoid its abuse. It is the duty of the engineer to contribute the knowledge of his profession in the preparation of legislation that will accomplish this objective.

10. Air pollution and its control involve many scientific problems that have not yet been solved. There is no simple or quick answer. Continued research in this field is vitally necessary. The engineering profession has the obligation of reaching the best engineering solutions to these problems.

11. It is the responsibility of the engineering profession to participate vigorously in the field of air pollution control.

General Considerations

Although vast in quantity, the air surrounding the earth is, in the present development of scientific knowledge, a limited resource. It consists essentially of oxygen and nitrogen in rather definite proportion, but also contains water vapor and rare gases in varying amounts. Its oxygen is essential to life and its nitrogen, through the action of plants, provides food. Its temperature and circulation keep us comfortable and its transparency makes possible the enjoyment of natural beauty, as well as safe aerial, land and marine transportation. It serves as a filtering and diffusing medium for sunlight and other forms of radiation, reducing them to levels acceptable to plant and animal life, and it is the medium by which water is returned to the land in the form of precipitation.

The air around us, the atmosphere, is continuously exposed to both natural and artificial contamination. Every individual contributes to natural contamination by his metabolism and to artificial contamination by his activities. The activities of industry also discharge large quantities of polluting materials into the atmosphere daily. Fortunately, under most conditions, these pollutants are rapidly dispersed and diluted so that the effect is unnoticeable. It must, however, be recognized that meteorological conditions may and sometimes do exist which prevent the rapid dispersion and dilution of the polluting materials. Such conditions may result in serious air pollution and may create a public nuisance, an economic barrier to further industrial expansion and a serious health hazard.

The unprecedented expansion of industries and increase in population has caused this problem to develop before basic research essential to an adequate understanding of the many factors involved was possible. Much remains unknown relative to the direct effect of the type and concentration of contaminants or the actual mechanism by which harmful results are produced in the human body. In certain types and concentrations of pollution, relative short times of exposure have proven fatal. The effects of long times of exposure to other types and concentrations are not as yet known. There is urgent need for basic research to develop more adequate knowledge in this area.

[†] This policy statement of *Engineers Joint Council* was prepared at the direction of the *EJC* Board of Directors which approved the statement at its meeting of September 13, 1957. The Committee which the Board of Directors asked to prepare the statement was: S. G. Hess, *ASCE;* R. M. Mahoney, *vice chairman, AIME;* G. V. Williamson, L. A. Winkelman, *ASME;* R. J. Faust, *AWWA;* G. T. Minasian, *AIEE;* E. J. Kilcawley, *ASEE;* P. J. Marschall, ASHAE; C. A. Bishop, *chairman, AIChE;* F. D. Vermilya, *SAME;* F. S. Mallette, *advisor;* E. P. Lange, *secretary;* L. K. Wheelock, *assistant secretary.*

As the air is a limited resource, its maximum use in the most efficient and economical manner is vitally important. To ignore the air's capacity to stabilize waste products or to overtax this capacity constitutes waste of a primary element in our economy, health, and welfare. The atmosphere is a natural resource that must be shared by all. Control of its pollution is a community problem. The individual must be subject to reasonable limitations on its use as may be required in the public interest.

The sources of natural pollution are many. As a result of natural phenomena, the atmosphere contains gases from the decomposition of animal and vegetable matter; products of volcanic and weathering action and of meteoric disintegration; spores; pollens and bacteria; and, in some sections, other vapors, gases and particulates. Generally these pollutants are absorbed or stabilized by the atmosphere.

Current technical data support the idea that the contaminants which cause serious pollution are those that result from man's own activity. The atmosphere is used as a disposal medium for man-made waste products. These wastes may be either the products of combustion or of other processes. When mixed together and subjected to sunlight and other natural phenomena, these products cause complicated reactions producing a multiplicity of secondary effects. The increase in industrial activity and in the concentration of our population has resulted in an increase in both the quantity and the concentration of such waste products in the atmosphere, a condition which often results in serious air pollution in urban areas.

In rural areas, on the other hand, pollution may result from excessive quantities of dust and vapors, both toxic and nontoxic, odors and pollen. Considerable progress has been made in the development of methods for controlling the sources of such pollution through scientific soil management and other methods of control.

While air movements disperse and dilute contaminating materials, meteorological conditions can be such that these materials may be transported with relatively little dispersion or dilution even over very great distances. Pollens, dusts and other contaminants from forest fires, wind action, volcanoes, and nuclear tests have been found in the atmosphere far from their sources. A change in meteorological conditions will cause the contaminants to settle out directly or fall to the earth with the rain or snow. As a consequence, air pollution is a world-wide problem.

To prevent detrimental concentrations of atmospheric pollutants, one must recognize what constitutes an offensive discharge and determine the allowable concentration of these constituents. Methods must then be found to keep the character and the amount of discharge under control. Most often the pollutant causing aggravation evolves from an operation in which some branch of the engineering profession is concerned. Effective and adequate control must therefore be started at the source of the pollution by engineering personnel.

Legislation at various levels of government may be desirable. Effective control can result only under legislation which is both fair and equitable, and at the same time provides for adequate penalties for violations. It must be carefully prepared and be flexible, yet specific, in order to be adjustable to the needs of all areas.

Responsible administration should start at the lowest government level capable of dealing with this technical problem. The public must be fully informed and accept the fact that each individual is both a contributor and a victim.

Causes of Pollution

Contaminating substances, both gaseous and particulate, are always present in the atmosphere. The quantity, concentrations and characteristics of the contaminating substances found in the air at a particular time and place determine the degree of air pollution.

Air pollution from natural causes is usually of minor concern. However, volcanic gases and ashes have, on occasion, laid waste whole countrysides, and spores and pollen regularly cause distress to large numbers of susceptible people, and fogs interfere greatly with our comings and goings. These are the results of natural phenomena and at present it is difficult to mitigate these forms of air pollution. It is, therefore, the pollution resulting from man's own activities upon which the efforts of engineers presently can be most fruitfully exerted. Some idea of the complexity of the problem to be solved may be indicated by a brief listing of the major activities of people in our existing society and their contribution to the air pollution problem.

1. Agricultural activities — dusts from land cultivation, fertilization, and crop handling; odors, of both vegetable and animal origin; pollens and insecticides.
2. Commercial activities — products of combustion from fuels used for heating and cooking and from garbage and refuse disposal by open burning or incineration.
3. Construction activities — chiefly dust.
4. Domestic activities — discharges similar to those from commercial activities differing only because of size and number.
5. Industrial and manufacturing operations — products of combustion of fuels, also dusts, gases and odors arising from materials being processed.
6. Transportation — products of combustion from land, marine and air vehicles, road dust and tire dust.
7. Waste disposal — products of combustion from the burning of waste materials, either in the open or by incineration, and dusts, gases and odors from the handling of waste materials or from areas where they have been dumped.

Any of these activities can, and on occasion do, cause annoyance to people. Such annoyances can range from the effect of an improperly adjusted domestic heating furnace, which discharges soot that soils the immediate neighborhood, to an open burning dump spreading a pall of smoke, noxious gases, and odors over a considerable area. They also include many types of commercial and industrial gases, dusts, or odors which, depending upon their quantity and characteristics, may be annoying or damaging to property.

There is another type of air pollution, which has come into prominence lately. It is a general pollution of the atmosphere above urban and metropolitan areas, which cannot be charged to a single individual or enterprise, but is a result of our complex society. The exhaust from a single automobile in proper mechanical condition is hardly observable. Yet the exhaust from two solid lines of such cars passing through a tunnel becomes so lethal that an elaborate ventilating system is required. Conditions in a narrow street, lined with tall buildings, are scarcely better unless our natural ventilating system, the wind, dissipates the fumes.

Thus, above many of our major metropolitan areas, because of the congestion of population, density of traffic, and magnitude of industrial operations, an immense and ever increasing amount of contaminants is poured forth daily into the atmosphere. There they react, not only with each other, but also with the water vapor and ozone naturally present. The net result is commonly referred to as smog.

The seriousness of the condition depends on two major factors. One is a function of the total amount and characteristic composition of material being discharged into the atmosphere. The other is a function of the meteorology and topography of the region.

The effect of meteorology is pronounced. On one day the air may be clear and visibility unlimited, on the next we can scarcely see the length of a city block. Sustained winds, atmospheric turbulence, and the lack of temperature inversions all help to dissipate the man-made fog above our cities. On the other hand, windless days, a "heavy" atmosphere, and nightly temperature inversions all tend to concentrate, rather than disperse, the pollutants. If these unfavorable atmospheric conditions persist for several days, the concentration of pollutants continues to rise.

Unfavorable topography likewise induces an increase in concentration levels, by confining the polluted atmosphere and preventing its lateral movement. Valleys, or even a range of hills, are the usual unfavorable topographical features.

Methods of Control

Control of industrial and domestic pollution may be attempted in one or some combination of three ways: (1) by dilution, (2) by abolition, or (3) by treatment.

Control by dilution is an age-old method. It has been used, knowingly or unknowingly, from the beginning of time and it will continue to be used as a means of final disposal for wastes. The method has many advantages and much capacity for disposing of contaminants effectively. It fails miserably, however, when its limitations are not strictly respected. These limitations, of course, are as capricious as the winds themselves. Complete reliance on the dilution method may, under adverse weather conditions, result in nuisance or more serious conditions. By taking advantage of favorable factors, such as isolation from urban population and releases of contaminants at reasonably high elevations, however, disposal by dilution can be satisfactory.

Another method of air pollution control is abolition of the sources of trouble. No doubt this is the perfect solution, but unfortunately, its application is often restricted because of cost or impracticability. Where abolition is practical it should be used in preference to other methods. For example, open fires, with their poor combustion possibilities and attendant hazards, should not be tolerated in most instances.

The third method of air pollution control is by treatment of the wastes to reduce their potency and other unfavorable characteristics before they are discharged into the atmosphere. This approach, in its simplest terms, is an adjunct to the dilution method; it can make the dilution method work to advantage. Many corrective methods are now available to the engineer to treat potential air pollutants. Some of the more common ones are: (1) superior combustion chambers, (2) scrubbing facilities, (3) settling chambers, (4) filters, (5) mechanical separators, (6) electrostatic precipitators, and (7) counteractants. Where applicable, each of these devices has provided a significant contribution to air pollution reduction.

Abatement of air pollution may also be accomplished by centralization of disposal functions as opposed to individual disposal. An example of this method of abatement is the collection of rubbish by a central agency from homes, apartments and commercial places for complete and adequate disposal by incineration or by sanitary land-fill method. The elimination of innumerable and inefficient individually owned incinerators by this plan, materially reduces the air pollution potential.

Many other practices and programs that were designed with other objectives in mind have helped reduce air pollution. For example, the paving or surfacing of streets and parking lots prevents the development of dust pollutions from these areas on windy days.

Thus, in most circumstances air pollution is amenable to control. Some pollution problems, however, have resisted solution and need the application of research if progress is to continue. In seeking an approach to air pollution control it is not enough to identify substances from the polluted air and then seek methods of reducing the quantities of these materials. Some of them may be only the innocuous end products of reactions of unstable substances that may be the real cause of the trouble. A knowledge of the chemical components of pollutants while airborne, of the catalytic substances present, of the reactions which occur and of the shifting equilibria which are reached under varying conditions will be necessary in identifying offensive materials and in developing methods for counteracting them. To meet this and many other challenges in this field, research is required. The recovery of sulfur from stack gases and the design and development of a satisfactory home and apartment incinerator which will minimize air pollution, are typical of the problems which need solution through study.

Indiscriminate discharge into the atmosphere of waste materials which may become obnoxious or toxic, simply because no other method of disposal is known, should no longer be condoned. Scientific study and research for the satisfactory control of such discharges should precede the event rather than follow it.

The cost of air pollution abatement should be commensurate with the benefits accruing to the people. Fortunately this condition normally prevails and, because it does, air pollution control is not beyond our reach. The present thinking on pollution control leans heavily on provisions for the reduction and treatment of wastes prior to the beginning of operations at new plants. By this means, pollution can be controlled before it has a chance to do any damage.

The Engineer's Function

Engineering involves directing the forces of nature and the activities of man to his own use, convenience and welfare. In view of air pollution's causes and effects, and the technical nature of its control, the engineering profession is qualified and is duty bound to contribute substantially to the control of air pollution.

Engineers are involved, through research, development, design, construction, installation, operation and maintenance, in activities that bring into being man-made sources of air pollution. Engineers have already made substantial contributions to the solution of air pollution problems by application of technical knowledge. Many of these contributions have resulted from efforts to utilize fuels and raw materials more effectively, while others have come from efforts specifically directed to minimizing air pollution nuisances and hazards.

Other professional disciplines are contributing to effective air pollution control in many fields; including agriculture, biology, government service, law, medicine, meteorology, politics, public health, science, and soil conservation.

The engineering profession is prepared to discharge its responsibilities in the physical control of air pollution by full participation with other professional disciplines, in establishing and effecting sound policies of control.

TECHNICAL ADVISORY COMMITTEE MEETINGS IN PITTSBURGH

At the Pittsburgh Annual Meeting in January many of the Technical Advisory Committees of the Committee on Research met to discuss their problems and projects. Following is a brief summary of what took place at certain of these meetings.

Heat Transfer Through Fenestration: Preparation of a proposal to the Committee on Research to study the effect of draperies on heat flow through fenestration was voted. It was reported that the testing phase on heat flow through metal awnings is complete with a paper reporting the results soon to be ready for publication. Attention was also given to the projected study of roller shades on which test work is already in progress at the Laboratory.

Insulation: The committee considered reports and statements presented by its Task Groups, and decided to accept recommendations made by the group assigned to Attic and Crawl Space Ventilation concerning material it had prepared for inclusion in HVAC Guide for 1959.

Physiological Research: The meeting was held at the Graduate School of Public Health at the University of Pittsburgh and those in attendance toured the newly completed building and laboratories. A report was received on factors affecting recovery from work in very hot environments. So also was a report made concerning the effects of low relative humidities at moderate temperatures, on which subject there is but little published information. Other topics reported on and discussed during the session include: environmental conditions for older people; temperature and humidity control in the care of the sick; effects of air conditioning on the productivity of workers; and concerning preliminary studies of work rates and resulting heat production at rates of 600 to 1200 Btu per hour.

Sound and Vibration Control: A vote registered the opinion of the committee that the measurement of the attenuation of sound in ducts, by using 2 reverberant rooms, should be more fully studied before being recorded as acceptable. It was also indicated that work is proceeding aimed at the development of a standard sound source, availability of which would greatly simplify the problem of measuring the sound output of fans by the reverberant-room method. A project is proceeding at the Laboratory concerned with noise generation and attenuation in ducts. Details of this general project and the subject of noise in ducts and its measurement came in for considerable discussion, during which the present status of the test work was outlined. The material on Sound—now appearing in the HVAC Guide—was reviewed and various suggestions were made looking toward revisions in future editions. A subcommittee was appointed to study the problems that arise in connection with package sound traps. The committee also heard a review of the work of the *ASRE-ASHAE* Joint Committee on Equipment Sound Testing, and of the Sectional Committee of ASA on Acoustics. Plans were discussed looking toward a proposed All-Industry Forum on problems of noise.

Weather Data: Much discussion took place concerning Summer Outside Design Temperatures following the presentation of a report on that subject. Consideration was given to methods of analyzing summer data, to the matter of relative importance of wet-bulb and dry-bulb temperatures, and as to what specific basis of probability should be used in a study of summer weather data to arrive at design figures. The committee voted to approve the method by which the data was obtained. The committee also indicated that it seems desirable to obtain data on both the 3rd highest and the 6th highest temperatures available at the weather stations. It also voted to authorize work on obtaining summer design temperature data.

The committee also heard a report on solar radiation but arrived at no decision as to ways in which this type of information can be improved under present circumstances. Discussion also extended to weather data for evaporative cooling and to means of estimating seasonal or yearly cooling loads and energy costs.

Evaluation of Air Cleaners for Air Conditioning and Ventilation

Part I — Apparatus

By K. T. Whitby[*], A. B. Algren[**], R. C. Jordan[†] and J. C. Annis[‡], Minneapolis, Minn.

This paper is the result of research sponsored by the American Society of Heating and Air-Conditioning Engineers, in cooperation with the Mechanical Engineering Department, University of Minnesota, Minneapolis, Minn., and the U. S. Public Health Service.

SUMMARY—This is the first of 3 papers describing apparatus for the evaluation of air conditioning and ventilation type air cleaners. A new K-1 carbon and coal (No. 2 Test Dust), a new dust feeder (Minnesota No. 3), and lint feeder (Minnesota No. 3L), have been developed which give approximately the same arrestance and dust holding capacities as with natural air-borne dust. The apparatus is suitable for the evaluation of weight, dust spot or particle count arrestance measurements on all types of air cleaners.

Part II will describe the application of this apparatus to arrestance testing and Part III its application to loading or life testing.

Since World War II, the number, types and diversity of application of air cleaners for ventilation and air conditioning purposes has grown rapidly. This growth has resulted in a continuing interest on the part of the ASHAE and the air cleaner manufacturing industry to develop air cleaner rating and testing methods which are commensurate with current needs.

In 1954, following the recommendations of the TAC on Air Cleaning, the ASHAE established a cooperative research project at the University of Minnesota directed toward doing such basic research as necessary to develop improved apparatus and procedures for the testing of all types of air cleaners for occupied spaces. The scope of this research was later increased with the receipt by the University of a Public Health Service Research Grant, with somewhat similar objectives.

This paper is Part I of 3 parts describing general purpose apparatus and procedures for the testing of air cleaners. The apparatus described should be considered as tentative since evaluation is still in progress and it has not yet been submitted as a recommendation for a standard to the ASHAE.

Part II will describe the application and evaluation of the apparatus for arrestance testing of air cleaners and Part III will cover its application to the determination of the life characteristics of air cleaners.

Requirements of a General Purpose Test Method: Commercial air cleaners are presently available in types ranging from low priced high-velocity lint filters to higher priced *absolute* type filters for critical applications. This broad span of performance and operating characteristics requires that any method of air cleaner testing intended for universal acceptance must have an unusual degree of versatility. Furthermore it must be inexpensive and simple enough to operate that these factors will not deter potential users.

Extensive consultation early in the project with those experienced in air cleaning indicated that the 2 improvements most needed were: (*a*) an aerosol-generator combination that would better reproduce air-borne dust characteristics; and (*b*) a versatile aerosol sampling system that would permit evaluation of dust spot, weight or particle size arrestance characteristics of all kinds of air cleaners with one set of apparatus. This series of papers describes the results of 4 years of work directed toward the fulfillment of as many of these requirements as possible.

Air cleaner test apparatus can be divided into 4 major functional divisions *viz.*: (*a*) duct system, (*b*) aerosol generators, (*c*) dust sampling system and (*d*) sample evaluation equipment. Therefore the discussion of the requirements of each functional division and a description of the apparatus is presented separately.

Duct System

Requirements: The duct system, in addition to providing a convenient mount for the air cleaner under test, must afford the following:

1. A convenient method for mounting all kinds of air cleaners from thin filter

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[‡] Research Fellow, Mechanical Engineering Department, University of Minnesota.

For presentation at the Semi-Annual Meeting of the American Society of Heating and Air-Conditioning Engineers, Minneapolis, Minn., June 1958.

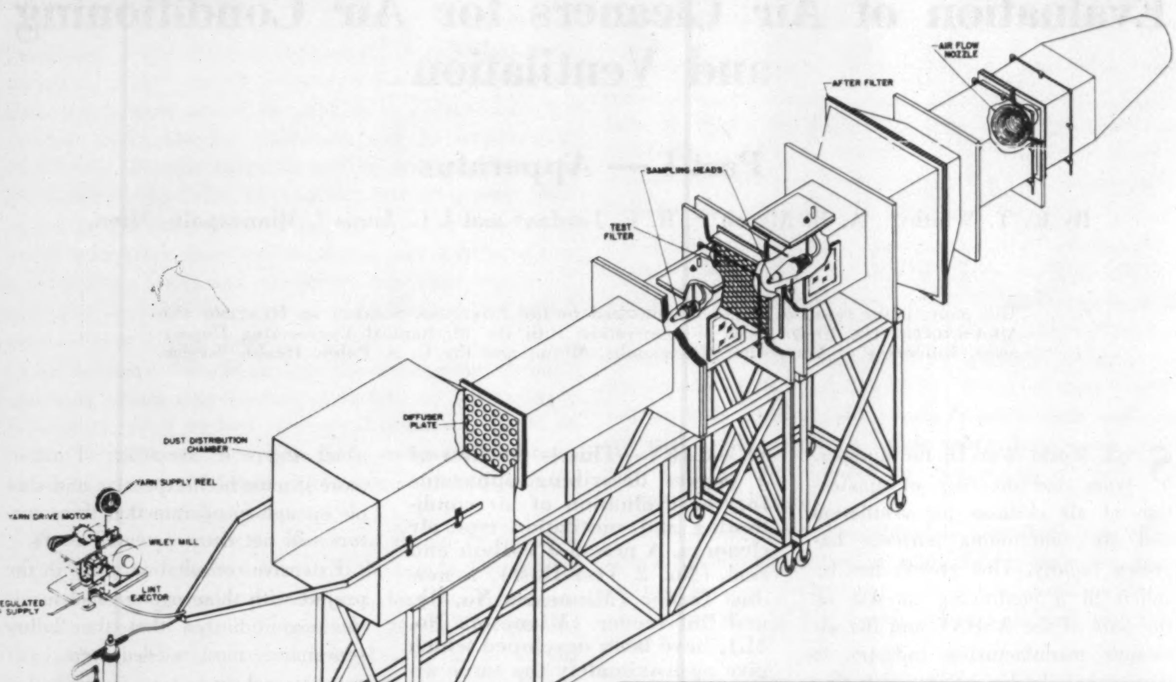

AIR FLOW NOZZLE
AFTER FILTER
SAMPLING HEADS
TEST FILTER
DIFFUSER PLATE
DUST DISTRIBUTION CHAMBER
YARN SUPPLY REEL
YARN DRIVE MOTOR
WILEY MILL
LINT EJECTOR
REGULATED AIR SUPPLY
DUST FEEDER

Fig. 1a — Complete air cleaner testing apparatus

media to electronic air cleaners several feet in depth;

2. A convenient and accurate method for measuring and controlling the air flow through the cleaner;

3. Satisfactory distribution of the aerosol over the cross section of the tunnel at the test station;

4. A flat velocity profile at the test station;

5. No significant changes in aerosol composition between entrance and test station due to settling in the tunnel;

6. Compactness, to save laboratory space.

Fig. 1*a* illustrates the air cleaner test apparatus and Fig. 1*b* shows some of the components diagrammatically. Fig. 2 includes the important dimensions of the duct system.

The air cleaner apparatus operates as follows: The high-velocity jets of dust and air from the dust feeders cause large scale turbulence and thorough mixing in the distribution

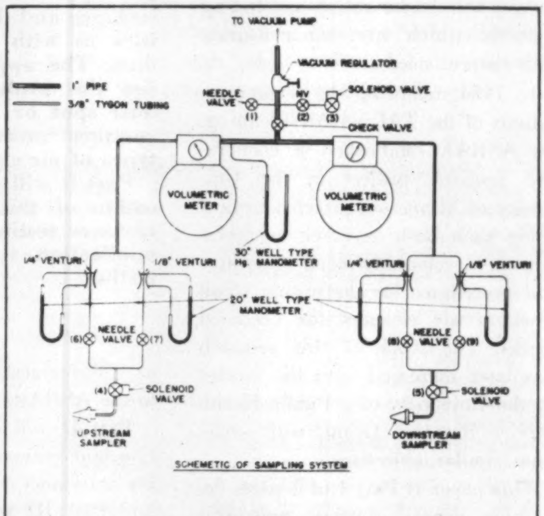

1" PIPE
3/8" TYGON TUBING
TO VACUUM PUMP
VACUUM REGULATOR
NEEDLE VALVE (1)
NV (2)
SOLENOID VALVE (3)
CHECK VALVE
VOLUMETRIC METER
VOLUMETRIC METER
30" WELL TYPE Hg MANOMETER
1/4" VENTURI
1/8" VENTURI
1/4" VENTURI
1/8" VENTURI
20" WELL TYPE MANOMETER
NEEDLE VALVE (6) (7)
(4) SOLENOID VALVE
UPSTREAM SAMPLER
NEEDLE VALVE (8) (9)
(5) SOLENOID VALVE
DOWNSTREAM SAMPLER
SCHEMATIC OF SAMPLING SYSTEM
GAGES
PRESSURE REGULATOR
SOLENOID VALVE
NEEDLE VALVE
100 PSIG COMPRESSED AIR
DRYOLITE DRYER & TRAP
DRAIN
DUST FEEDER AIR SUPPLY SYSTEM

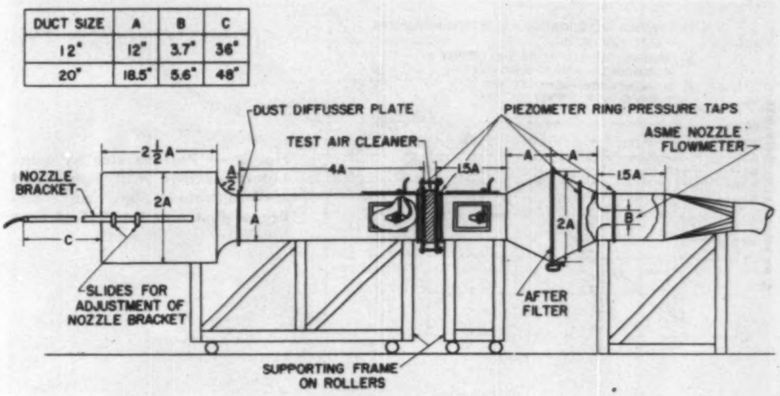
Fig. 1b — Diagram of sampling system (top) and dust feeder air supply system of air cleaner testing apparatus

chamber; the perforated dust diffusion plate at the duct entrance breaks up the large-scale turbulence and distributes the air and dust so that a flat velocity profile and a uniform dust distribution exist at the test station.

The after filter of a relatively effective medium has 2 functions. It serves to clean the air of dust not removed by the air cleaner and it can also be used for whole stream sampling as in the *Air Filter Institute* method of determining weight arrestance. The flow nozzle is so sized that when used with a 14-in. combined draft gage and manometer, satisfactory accuracy is obtained for duct velocities ranging from about 150 to 900 fpm. For maximum flexibility a blower capable of 1 in. of Hg at 900 fpm duct velocity is required if an after filter is used.

Duct size is determined by the air cleaners to be tested. Though the University of Minnesota equipment utilizes a 12-in. square duct, 18½ × 18½ and 24- × 36-in. ducts constructed by an industrial firm have also operated satisfactorily. The largest duct required some additional baffles in the dust distribution chamber to obtain satisfactory dust distribution.

Though a vertical duct will eliminate all settling of the test dust, this position is impractical in most laboratories. Settling of the proposed test dust in the horizontal duct is negligible and that of the lint is less than about 5 percent for duct velocities above 300 fpm. For applications requiring lower duct velocities the lint feeder discharge can be moved closer to the test station.



DUCT SIZE	A	B	C
12"	12"	3.7"	36"
20"	18.5"	5.6"	48"

Fig. 2 — Schematic of wind tunnel

Table 1 — Physical properties of average air-borne dust and of proposed test dust

Property	Air-borne Dust		No. 2 Test Dust
	Range	Average	80 % Coal, 20% K-1
Volume geometric mean size	0.8-8	3μ	2.2[a]
Number geometric mean size	0-0.2	0.03μ	0.03[a]
Particle density	1.5-3.0	2.1 gm/cc	1.70
Porosity	0.5-0.85	0.65	0.6
Bulk density	0.2-1.5	0.7 gm/cc	0.5
Upper particle size	15-50	25μ	25
Fraction fibrous particles	3-35	10%	0 to 100% possible
Color	gray-black	dark gray	black
Shape		Irregular	Irregular + carbon chains
Electrical Resistivity[b]	1.5x10^5	10^8 ohms cm^2/cm	54[c]
Size distribution	(See Fig. 3)	(See Fig. 3)	(See Fig. 3)[a]

[a] After dispersion by Minnesota No. 3 feeder.
[b] Under 130 kg per cc pressure.
[c] Resistivity of K-1 carbon alone 1.5, of coal alone 7000.

Table 2 — Reproducibility of No. 2 Test Dust penetrations on 3 representative air cleaners by dust spot and weight

Air Cleaner	Permanent D_{fe} = 400 ; S_{fe} =8[c]				Electronic				20 oz Felt, with D_{fe} = 6.9; S_{fe} = 39							
Penetration[b] — %	P_w[e]				P_d				P_w				P_d			
Dust Lot No.	6	9	17	A[a]	6	13	17	A[a]	6	13	17	A[a]	6	13	17	A[a]
Run 1	62.2	60.6	60.4	81.3	8.62	9.18	9.12	10.90	32.0	32.2	30.4	58.4	62.5	67.8	70.3	77.4
Run 2	62.3	59.6	61.5	60.5	8.64	9.25	9.12	10.70	31.9	32.9	29.3	39.2	65.8	65.7	69.1	81.8
Run 3	60.2	59.6	62.4	72.2	8.69	9.28	9.12	10.52	32.3	32.6	30.8	68.0	66.1	67.3	64.3	82.0
Run 4												38.7				78.0
Mean		61.9		71.3		9.00		10.71		31.9		51.1		66.5		79.8
F		0.84				223				18.7				1.48		
$F_{0.05}$		5.14				5.14				5.14				5.14		
S (Dust Lot) - %[d]		Not Significant				4.2				4.7				Not Significant		
S (Exp.) - %[d]		1.5		12.0		0.14		0.9		1.6		24.6		3.4		2.7
P_A/P No. 2 Test Dust		1.15				1.19				1.60				1.20		

[a] Normal air-borne dust in the Particle Technology Laboratory.
[b] Arrestance or efficiency = 100 — Penetration.
[c] The effective fiber size, D_{fe}, and the filter solidarity factor S_{fe} have been determined from filter pressure drop *vs.* velocity data by a procedure which will be described in a future paper.
[d] Variances given are percent of the penetration value.
[e] No adhesive.

Aerosol and Aerosol Generators

The many aerosols and aerosol generators that have been used for evaluating air cleaners have been reviewed in detail in a previous reference.[1] Some of the aerosols that have been used for the testing of ventilation type air cleaners are natural air-borne dust, standardized fine Arizona road dust, Cottrell precipitate, carbon black, mixtures of the foregoing with lint such as the *AFI* test dust and certain oil smokes such as those of dioctylphthalate.

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[1] Exponent numerals refer to References.

Aerosol or Dust Requirements: Studies of a number of those dusts and of the properties of natural air-borne dust which determine air cleaner performance established the following desirable properties for a general purpose test aerosol.

1. Physical properties, such as density and particle-size distribution, should approximate those of average air-borne dust. Properties of average air-borne dust as determined from the ASHAE air-borne dust survey[2], and the properties of the proposed No. 2 Test Dust are given in Table 1.

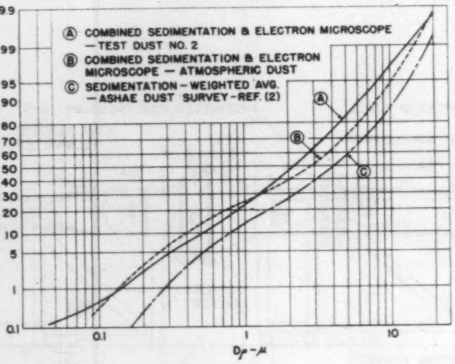


Fig. 3 — Particle size by combined electron microscope and sedimentation on an air-borne dust and No. 2 Test Dust

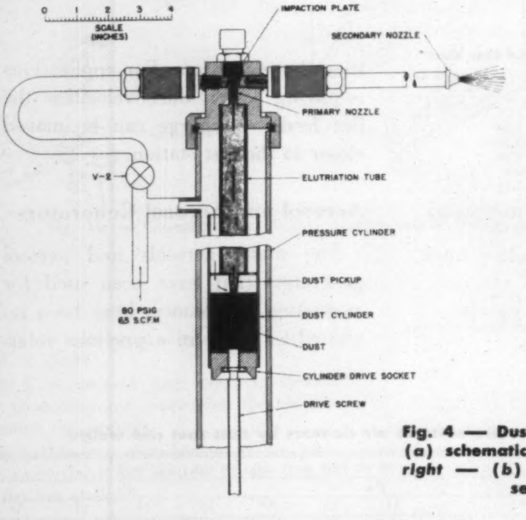
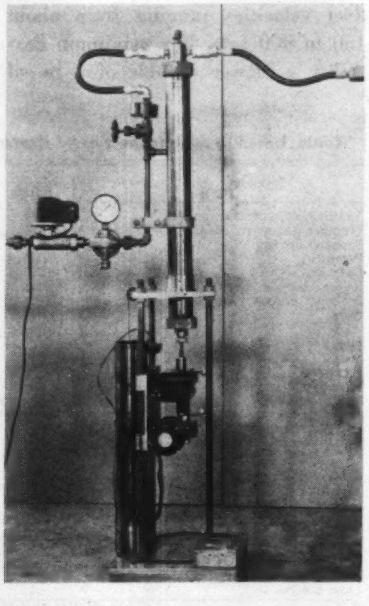


Fig. 4 — Dust feeder. *Left* — (*a*) schematic of feeder head; *right* — (*b*) dust feeder assembly



2. Arrestance and loading characteristics of representative types of air cleaners on the test dust should be approximately equivalent to those on average air-borne dust.

3. Production, storage and dispersion problems must be reasonable. Use of a single base dust for dust spot and weight arrestance tests and for loading tests is desirable.

4. Base dust and lint aerosol generators should be separate for maximum flexibility of operation and to eliminate the problem of blending and dispersing a mixture of lint and base dust.

Base dust: After considerable research and investigation most of the requirements just listed were met by a mixture of 80 percent anthracite coal and 20 percent K-1 carbon, hereafter designated as No. 2 Test Dust, prepared in the following manner:

Five hundred fifty (550) grams of oven-dried high density anthracite coal (ρ = 1.7 gm per cc) is ball milled at 67 rpm in a one gallon porcelain jar with 2.6 kg of ¾ to 1½ in. flint pebbles for 72 hr. One hundred thirty eight (138) grams of oven dried K-1 carbon is then added and the mixture ball milled for 8 hr. The prepared dust is then stored in air tight containers in the presence of silica gel until used.

A comparison of the most important physical properties of average air-borne dust and the proposed No. 2 Test Dust is given in Table 1. It will be noted that this dust approximates the density, particle size distribution and shape of average air-borne dust quite well. Though its electrical resistivity is low, considerable experience in using the dust for testing electric air cleaners has indicated no adverse effects.

Table 2 illustrates the reproducibility of dust penetration measurements using the No. 2 Test Dust and normal air-borne dust on 3 representative types of air cleaners. The permanent filter was washed with benzol after each run. No adhesive was used. Later papers will include data on the effect of adhesives. Face velocity was 520 fpm.

The electronic air cleaner was of the conventional 2-stage ionizer and plate type. Good voltage regulation and measurement was necessary to achieve this degree of reproducibility.

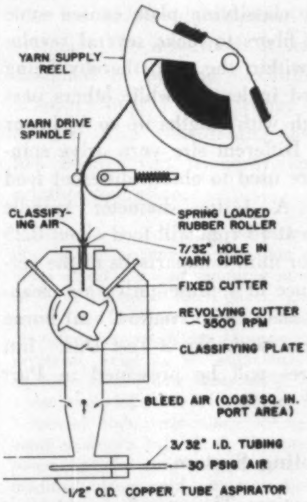
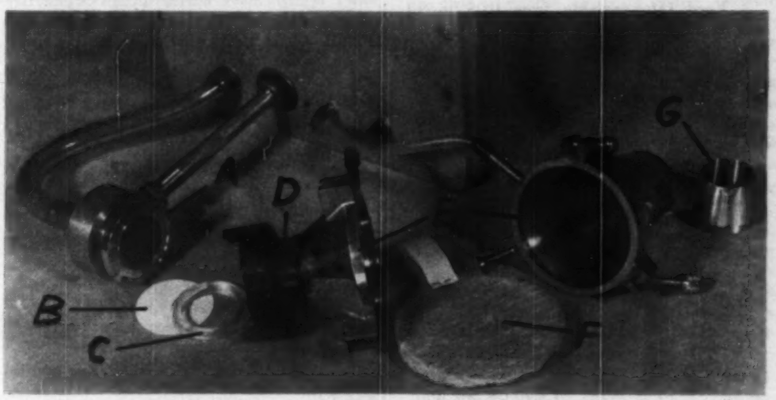


Fig. 5 — Schematic of lint generator (Minnesota No. 3L)

The 20-oz wool felt was untreated and was run at 42 fpm face velocity using the filter media attachment shown in Fig. 6. A new sample of felt was used for each run on each dust.

From Table 2 it may be concluded that variability in the air cleaner being tested and in the different dust lots is greater than the variability of the evaluation techniques used. The high experimental variance *S* for the felt on laboratory air-borne dust is due to the large variation in relative proportion of the larger particles in air-borne dust as determined by the ASHAE air-borne dust survey. It will be noted that the ratio of the penetration on laboratory air-borne dust to the penetration on the No. 2 Test Dust is greater than one for these experiments. From the previous dust survey[2] it is known that the air-borne dust in the particle laboratory is significantly finer than the average shown by the dust survey. Probably P_d and P_w on air-borne dust in other industrial cities will be found to be more nearly equivalent to those of the No. 2 Test Dust.

In Part II, comparative data on several other test dusts and dust feeders will be presented, showing that the reproducibility of the new sonic jet feeder Minnesota No. 3, No. 2 Test Dust combination is equal to or better than other combinations.



A — sampler body, *B* — sampling media, *C* — retaining ring, *D* — sampler front, *E* — high performance filter mat attachment, *F*—test filter mat, and *G*—isokinetic tip

Fig. 6 — Exploded view of sampling head and high performance filter media attachment

Table 3 — Downstream/upstream airflow ratios for different sampler tip combinations

Downstream		Upstream Tip No.							
Tip No.	Dia., Inches	None	1	2	3	4	5	6	7
None	1.375	1	1.21	1.72	2.56	5.15	8.20	15.5	30.3
1	1.25	0.825	1	1.42	2.11	4.25	6.77	12.6	25.0
2	1.05	0.581	0.704	1	1.49	3.00	4.76	8.89	17.6
3	0.860	0.390	0.473	0.670	1	2.01	3.21	5.97	11.8
4	0.607	0.194	0.235	0.333	0.497	1	1.60	2.97	5.90
5	0.481	0.122	0.148	0.210	0.31	0.63	1	1.86	3.70
6	0.352	0.065	0.079	0.112	0.17	0.34	0.54	1	1.98
7	0.250	0.033	0.040	0.057	0.085	0.17	0.27	0.50	1

	P_s, Inches Hg.	
Tip No.	20	15
None	288	340
1	336	410
2	476	580
3	710	867

Maximum duct velocities at which isokinetic sampling can be achieved with various tips using 1106 BH glass fiber paper, fpm.

Base or Aerosol Dust Generator: Research on the dispersibility of fine dusts having size distributions similar to air-borne dust showed that ordinary aspirator type aerosol generators were incapable of dispersing such dusts reproducibly and completely. To obtain the better dispersion deemed necessary, the sonic jet dust feeder, Minnesota No. 3, illustrated in Figs. 1*a*, 4*a*, and 4*b* was developed, incorporating the following features:

1. Good dispersion of the dust as a result of the passage of the air-dust mix-

ture through 2 critical nozzles in series and the impaction of the dust at near sonic velocities on an impaction plate;

2. The second critical orifice mounted at the point of dust discharge to eliminate the effects of agglomeration in the discharge hose;

3. Feed rate variable from 0.05 to 10 gms per min, achieved through the use of interchangable dust pickups and dust cylinders in combination with a variable speed drive;

4. Elutriator tube to reject large dust aggregates.

Operation: The feeder head and attached dust pickup are removed by unscrewing the top cap. This permits removal of the dust cylinder for loading with dust and weighing during filter loading procedures. In order to permit the feeding of a predictable weight of dust per unit time, the dust may be compacted to a known bulk density within the dust cylinder. As long as both the dust and compressed air are dry, compacting the dust does not seem to affect the dispersion.

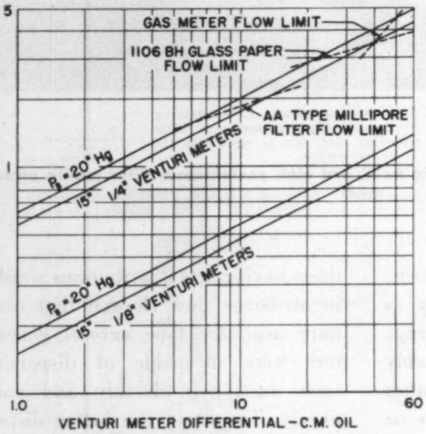


Fig. 7 — Air flow relations for sampling system venturi flow meters

Regulated dry compressed air at approximately 0 F dew-point and 80 psig enters the pressure chamber and flows down between the elutriator tube and dust cylinder to the pickup foot. Here the thin slice of dust scraped off by the rotation of the dust against the pickup foot is carried through the foot slot, up the elutriator tube, through the primary nozzle, against the impaction plate and out the discharge hose to the secondary nozzle. To maintain the desired pressure ratio across the secondary nozzle as the nozzles wear, a small amount of air may be bled through valve, V-2 Fig. 4*a*. The nozzles and impaction plate are replaceable since they wear when abrasive dust is being fed.

Evaluation of this feeder along with several others has shown it to be versatile and reproducible. The only problem not yet completely solved is occasional puffing and uneven feeding when it is turned on or off at very low feed rates. This occasionally creates a problem during dust spot evaluations where very low optical densities are required.

Lint Generator: The life and hence the maintenance cost of ventilation type air cleaners depends primarily on the concentration of fibrous particles in the air being cleaned. Therefore any good test procedure must satisfactorily reproduce the fibrous fraction.

Studies* have shown that it is difficult to blend and feed mixtures of base dust and a lint having a character and concentration similar to that of normal air-borne dust.[2] Therefore the separate lint generator shown in Figs. 1*a* and 5 has been developed from the standard medium size mill. This generator is capable of continuously converting fine cotton knitting yarn into a lint aerosol that is a reasonable approximation of natural lint. The problem of generating a broad distribution of fiber lengths has been solved by the combination of the right amount of classifying air leaking through the yarn guide and a ⅛-in. *ski jump* at the trailing edge of the classifying plate. The *ski jump* on the classifying plate causes some of the fibers to make several revolutions within the mill, thereby being reduced in length, while others pass through with lengths up to ¼-in. or more. Different size yarn drive spindles are used to obtain different feed rates. A ¼-in. diameter spindle driven at 15 rpm will feed about 0.25 gms per min. Comparisons of the performance of representative air cleaners loaded with natural air-borne dust and with No. 2 Test Dust—lint mixtures will be presented in Part III.

Sampling System

Function: The sampling system is used to obtain a representative sample of the dust upstream and downstream of the test air cleaner. The basic requirements for a satisfactory sampling system can best be understood by considering the permissible range of variation of the variables for the calculation of air cleaner performance in Equation 1.

$$P = (C_d\ A_d/q_d\ t_d)/(C_u\ A_u/q_u\ t_u) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

For practical reasons A_u is usually made equal to A_d. Since the amount penetrating an air cleaner may vary from 100 percent to less than 1 percent this means that provision must be made for accurate measurement of the ratio $(C_d\ q_u\ t_u)/(C_u\ q_d\ t_d)$ over nearly a 100 to 1 range. Such common concentration measuring methods as the dust spot and weight method are limited to approximately a 5 to 1 range or less where C is proportional to the measurement made. Thus, it is necessary to vary the total quantity of air sampled, Q_u, upstream. This may be done by varying either q or t. Practical considerations make it difficult to use more than about a 20 to 1 ratio of q_d/q_u, so that variable time sampling must also be used for penetration measurements of less than 1 percent.

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*The filter loading portion of the ASHAE Dust Survey will be published in the future.

A thorough theoretical and experimental study of all of these factors has led to the development of the system to be described. It has been designed to provide flexibility and accuracy over a broad range of conditions. Also considerable attention has been given to convenient and reliable operation.

Features: 1. Sampling heads have been designed to accommodate 47 mm diameter disks of all common sampling media such as W-41 chemical filter paper, glass fiber paper, and millipore filters. This permits microscope count, light transmission measurement, weighing or sedimentation size analyses of the dust sampled.

An exploded view of the sampler with a special high performance media attachment is shown in Fig. 6. The main components of the sampler parts A and D are modified from old style commercially available millipore filter holders. In normal use the isokinetic tips G screw directly into D. The inside diameter of ring C and the active area of the porous stainless steel backing plate in A must be exactly equal to provide a sharply defined spot for dust spot evaluations.

Attachment E is provided to enable the evaluation of 3-in. diameter pieces of high performance filter media at face velocities between 10 and 70 fpm while operating the duct system at velocities high enough to obtain good dust distribution and accurate flow measurement. The isokinetic tips screw into the front part of E.

Seven isokinetic tips having the dimensions given in Table 3 have been used. Tips have a 15 deg taper and 1.375 in. — 18 threads. Table 3 also gives the isokinetic upstream to downstream air flow ratios for various combinations of tips. For the testing of specific types of air cleaners, all of these tips would not be necessary.

2. Rather elaborate air flow metering equipment has been found necessary to test all kinds of air cleaners with acceptable accuracy. From Fig. 1b, it will be noted that 2 types of flow meters are provided. Dual range venturi flow meters are provided in each sampling line for accurate setting and measurement of flow rates. Precision variable area rate meters could be used instead of the venturi meters. In addition volumetric meters are provided. It will be noted that q_u t_u and q_d t_d represent the total volume of air drawn through the upstream and downstream sampling media respectively. Thus the volumetric meters permit direct measurement of these air volumes unaffected by small changes in airflow rate due to loading of the sampling media. Also short interval variable time sampling can be incorporated without the use of accurate time measurement.

The calibration accuracy of the metering system depends on the accuracy required. All meters used in the University of Minnesota test setup have been calibrated to better than ± 1 percent. For most air cleaner testing ± 2 percent is probably adequate.

Fig. 7 gives the flow meter calibrations for the venturi meters. Accurate measurement can be obtained from about 0.2 to 4.0 cfm of free air. Also shown are the gas meter limits and the maximum air flows which can be obtained using type AA millipore filters and 1106 BH glass fiber paper. The latter appears to be best for most purposes.

The upstream and downstream flow meters are connected to the vacuum system so that they always operate at the same pressure. This permits using the ratio of the indicated airflows without correction for pressure in Equation 1.

3. This sampling system may be used to test air cleaners with arrestances above 99 percent by cycling the upstream solenoid. Since the volumetric meters integrate the actual air flow, accurate measurement of the on-off periods is not required. To provide a statistically valid sample, however, the rate of cycling should be such that at least 20 samples are taken during a run. The timer used permits adjustment of the on-period from 1 to 60 sec and the off-period from 5 sec to 5 min.

Nomenclature

P = penetration (arrestance = 1 − P).
P_d = dust spot penetration.
P_w = weight penetration.
P_v = volume penetration.
q = sampling rate, cubic feet per minute.
t = sampling time, minutes.
A = sampling media area.
C = dust per unit area of sampling media.
ρ = density, grams per cubic centimeter.
P_s = absolute pressure in sampling system, inches mercury.
S = variance.
S_{fe} = effective filter solidarity factor.
D_{fe} = effective filter fiber size, microns (μ).
D_p = particle size, microns (μ).
OD = optical density.
F = F ratio.
$F_{0.95}$ = F ratio for 95 percent significience level.

Subscripts

u = subscript denoting upstream.
d = subscript denoting downstream.

4. From Fig. 1*b* it will be noted that a bleed needle valve (2) and solenoid valve (3) in series have been provided so that when the sampling system solenoid valves are closed, the valve (3) opens thereby keeping the air flow through the vacuum pump unchanged and the static pressure in the meters the same. This permits instantaneous starting and stopping of the sampling system without any gas meter integration errors due to pressure changes. Though not necessary, a vacuum regulator makes for more convenient operation of the system.

Control of the entire air cleaner system is possible by either an interval timer or a special dust control device which are provided but not illustrated here. The control device which will be described in a later paper, samples the aerosol in parallel with the upstream sampler and continuously evaluates optically the dust deposited on a piece of filter medium. This instrument can be set to shut off any part or all of the entire air cleaner apparatus after a predetermined amount of dust is fed. It is particularly useful when running dust spot evaluations with either atmospheric or No. 2 Test Dust.

Operation: Because of the many modes of operation required for the evaluation of different types of air cleaners by the different methods, such as dust spot and weight, only the general procedures are described here. Specific procedures will be discussed in Parts II and III.

In general, an arrestance evaluation requires the 4 following steps.

1. Selection of duct velocity, isokinetic tips, and sampling rates with the aid of Table 3 and graphs similar to Fig. 7, so that the amount of dust collected upstream and downstream will be roughly the same.

If the high performance filter media attachment shown in Fig. 6 is used, the downstream sampling rate is determined by the face velocity at which it is desired to test the media. As illustrated, the attachment is designed to test 3-in. active diameter media specimens. This is satisfactory for face velocities down to about 10 fpm. Lower velocities would require a larger active area to maintain adequate downstream sampling rates.

2. Adjusting of the sampling system with clean, previously evaluated sampling media installed, by means of the appropriate valves.

3. Taking of appropriate size dust samples (0.1 to 0.9 O.D. for dust spot and 5 to 15 mg for weight) with the dust feeder operating at an appropriate feed rate. Dust spot runs may be as short as 1 min, while weight evaluations using natural atmospheric dust as the test aerosol may require 24 hr or more.

4. Removal of sampling media and evaluation by the appropriate method, (*i.e.* particle count, light transmission, weight or sedimentation size analysis).

The air cleaner penetration is then calculated from Equation 1.

Simulated air cleaner life or loading procedures are still being evaluated so that the procedure to be described here is tentative. In general this procedure is required.

Dust feeder, lint generator and sampling system are prepared and adjusted to the desired rates. Dust and lint are then fed and the dust spot or weight penetration and the dust cylinder and yarn reel weights are then determined at preselected pressure drops (*i.e.* clean, 0.2-, 0.35- and 0.5-in. water gage for a typical panel filter).

Weight penetrations may be determined with either the sampling system or from the weights of the test filter, after filter and dust cylinder.

Sample Evaluation

Weight: An ordinary 0.1 mg sensitivity analytical balance is satisfactory for weighing the 1106 BH glass fiber paper used for weight penetration measurements. This paper has no binder and shows negligible weight changes with normal humidity variations.

Dust Spot: A photometer of more than ordinary sensitivity is required to measure the light transmission of the 1106 BH paper accurately. A null photometer such as that described previously[3] is most satisfactory. W-41 chemical paper is not recommended because of its low arrestance (85 percent) on the No. 2 Test Dust.

Particle Count: Count arrestance is readily determined from particle counts on millipore filters. Either light or electron microscope counts may be used.

Sedimentation Size Analysis: Centrifuge sedimentation particle size analysis of samples collected on millipore filters can be made by previously described techniques[3]. The sediment column height for the upstream and downstream samples may also be used to calculate the dust penetration. This volume penetration, P_v, is approximately equal to the weight penetration.

References

1. *Air Pollution Handbook*, by Magill, Holden and Ackley (McGraw-Hill Book Co., Inc., New York, 1956).

2. The ASHAE Air-Borne Dust Survey, by K. T. Whitby, A. B. Algren, R. C. Jordan and J. C. Annis (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, November 1957, p. 185).

3. ASHAE Research Report No. 1597—The Dust Spot Method for Evaluating Air Cleaners, by K. T. Whitby, A. B. Algren and R. C. Jordan (ASHAE Transactions, Vol. 63, 1957, p. 171).

THERMAL CONDUCTIVITY AND INSULATION

Six of 7 papers presented at a February, 1957 meeting of *ASTM* are printed and available (at $2.75) as ASTM Special Technical Publication No. 217. The book, in hard cover, contains 86 pages and bears the title *Symposium on Thermal Conductivity Measurements and Applications of Thermal Insulations.* Three of the 6 papers are authored by members of ASHAE, *viz.*: D. D'Eustachio, Port Allegany, Pa., F. A. Joy, University Park, Pa., and A. G. Wilson, Ottawa, Ont., Canada.

INDUSTRIAL NOISE CONFERENCE

With morning and afternoon sessions the 4th Industrial Noise Conference is being held in New York at the Hotel New Yorker on May 8, 1958. The program is an all-day affair and is sponsored by Associated Industries of New York State. The morning session is devoted to the subject of Noise and its Effect on Hearing, while the afternoon session is on the latest developments in machinery modification. A registration fee of $4.00 is payable at the door. Dr. Allen D. Brandt, Society member, is one of those in charge of planning the conference.

John R. Allen Memorial Library

The ASHAE Committee on Research gratefully acknowledges the following gifts to the John R. Allen Memorial Library, which is maintained at the Society's Research Laboratory, 7218 Euclid Ave., Cleveland 3, Ohio.

Mechanical Engineering Practice, by Shoop and Tuve.
Gift of T. C. Min, Alabama Polytechnic Institute,
Auburn, Ala.

Theoretical Hydro-Dynamics, by Milne-Thompson, 3rd Edition. Gift of T. C. Min.

Year Book of the Heating and Ventilating Industry, 1957.
Gift of the Industry.

Proceedings of the Institution of Mechanical Engineers,
Vol. 170, 1956. Gift of the Institution.

The presentation of textbooks and pamphlets in the field of heating, ventilating and air conditioning and allied fields, by authors and others, will be welcomed by this library. Suitable book plates carry the name of the donor and date of the gift.

Looking into the Future

By

Edmund Geo. Good, Jr.

The author is a member of the firm of Edmund George Good, Jr., Architects, Harrisburg, Pa. A presentation at the Symposium on School Heating, Ventilating and Air Conditioning at the 64th Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Pittsburgh, Pa., January 29, 1958.

A LOOK INTO THE FUTURE can no longer be calculated to shock the common man. He has already been prepared to accept a *trip to the moon* or an *atomic pill* to heat his home. To the modern mind it is only a question of time.

Between this future and the world today there is a great gap — a gap that can be bridged only by new building technology, developed, in part, by the men who meet today. The engineer is a practical man, but he also thinks broadly of the future. At this moment, he holds in his hands the threads of development which lead to the actualities of tomorrow.

Our *look into the future* today will confine itself to schools, and must, of necessity, be of a general rather than detailed nature. The following thoughts are strictly personal.

What are some of the educational trends which will determine the school building of 25 *years from now?*

First, there has been a re-emphasis of the broad liberal-arts background. There must be an underlying general-education foundation for all students, if the American culture is to survive the specialization brought about by a technical age. Of course, *reading, writing,* and *arithmetic* are fundamental.

The new curriculum planning is to fuse or integrate the old standard subjects — one with another; to include the practical application or laboratory approach using related crafts, arts, or science experimentation; and to offer this general education in blocks of time, within interrelated spaces, and under the direction of a teacher-team. Gone is the formal pattern of individual classrooms with all classes passing when the bell rings. Gone is the rigid schedule. Gone is departmentalization. Gone is the institution.

To satisfy the requirements of a technical age, along with a good general-education foundation there must be not fewer but more specialized spaces. This is true at the high school level and beyond. Here, as specialization becomes greater, classes become smaller. Formal instruction and teacher-student planning might be conducted with a half dozen students — very small spaces will do. On the other hand, it is here where the practical application, the laboratory work, might require much greater space per student and a greater demand for special equipment. In this sphere should be included all vocational trade and industrial training. Now as the requirements of this technical age change, so must the training program. Blacksmiths and wagon-makers are no longer trained. Aeronautical engineering and aero-dynamics, likewise, are no longer confined to internal-combustion reciprocating engines and sub-sonic speeds. There must be variety. There must be flexibility.

As specialization increases, it becomes more difficult for the young student to see his way clear to the best field of application of his talents. As population increases, there is a pressing temptation to offer mass guidance backed up with impersonal testing. This is not the American way. It will not even meet the need. Individual guidance is the only answer, and this answer is best made with teacher-team operating under a unit-school head counselor.

Just as guidance should be individual, so should the training and study aspects of education be group enterprises. However, these group should not be too large. All students, particularly adolescents, need a feeling of belonging. Living and working together is important. In the larger schools, the bringing together of groups with common interests in clusters seems the answer. If this thought pervades the curriculum planning, as well as the physical plant, the unit-school idea becomes a must.

Lastly, there should be an effort toward community service which transcends the basic function of education of the child. Adult education programs become more necessary as technology requires greater flexibility in the labor and management reserve. Tax money should serve as many community enterprises as possible, because the awful truth is that most areas are actually losing their identities as communities. Sociologically speaking, television programs out of New York have taken the place of the barn dance, the strawberry festival, and the band concert. In the new suburbia and inter-urbia the school often stands as the only center through which a community is identified. Tax money invested in construction and equipment can be justified only by maximum utilization, and, if the educational processes cannot operate full-time, then community service should be utilized to fill the gaps.

If the foregoing statements in any way sketch out the educational trends, what effect will this have on school buildings of the future?

The writer sees many buildings, not one. Elementary schools will be domestic in scale, scattered, definitely related to the neighborhood, in fact, defining the neighborhood, not much removed from the family unit. Secondary schools will be large (to support an increasing number of technical subjects and specialized fields of training) but not in one building, rather a complex of buildings, unit schools, clustered around a central core. Each unit will be small, informal, varied, serving individual as well as small groups, guiding students in general education, separately staffed and administered, housing students as a family until specialization in the upper grades intermixes them with other students from similar units by subject interest. Technical classes are conducted in planning rooms, well-equipped laboratories, and shops in the core buildings. The union, the commons, the assembly or whatever one calls the intermittent gathering of students from all units also forms the central core.

What effect will fused subject matter, laboratory techniques, blocks of time, and teacher-teams have on the building planning? Just this: *variety*. There will be small offices, counselling rooms, reference libraries, sound booths, dark-rooms. There will be small classrooms, large classrooms, lecture rooms, laboratory space, activity equipment. There should be space where 50 or 150 students can assemble for closed circuit television. All this must be within each school unit.

If this sounds economically impossible, it is not, *if* another important feature is kept in mind: *flexibility*. Space usage must overlap if total time utilization of space is to be accomplished. This poses certain problems which only future technology can answer fully. Today, however, there are certain products which have already been engineered to meet future demand: soundproof folding partitions, portable platforms, stacking chairs and tables, magnetic chalk and display boards, modular casework, overhead daylighting with darkening shutters for interior spaces, heat and glare controlling glass, shade screening laminated within sheets of glass so that 360 deg orientation may be used. The writer has yet to see a venetian blind sealed between glass to provide insulation, no maintenance, automatic sun control, uninterrupted vision (when required) and yet total darkening of the room as desired.

Within these new buildings there should be complete environment control. The word *should* is used because the writer thinks it is not only possible but practicable. A school building should in no way distract from or dampen the educational process. Rather, it should stimulate enthusiasm and efficiency — and this brings up the subject of mechanical conditioning.

However, before presenting some ideas of general mechanical conditioning, let us pause and consider the *why, how and when* of *summer* air conditioning (by this, is meant the *cooling cycle*).

Since Sputnik, one can hardly pick up a newspaper, magazine or periodical of any type that does not stress education in some form or another.

Certainly Governor Leader has recognized the problem and it would appear that Pennsylvania, although not out in front, is cognizant of the situation and has made a fair appraisal of the issue.

The why, how and when of air conditioning could be summed up by a few facts:

In 1900 the total population was 76,000,000.

In 1955 the total population was 165,000,000 — a figure which only 10 years before the Census Bureau believed would not be reached until the year 2000, if ever.

In 1936 the number of babies born in this country was less than 2,500,000.

Last year the number was approximately 4,250,000, and on the average, these children will live much longer than those born 20 years ago.

The estimates for 1975 are astounding!

These facts might not have such serious educational implications in some countries as they have here. The White House Conference on Education in 1953 stressed one point:

> *The opportunity must be given to every American Citizen to attain the highest level of education and training of which he is capable.*

This means classroom space, teachers and time.

How is one going to get this space? How are the teachers going to be obtained? Is there time?

Pennsylvania is committed now for subsidies of $925,000,000 up to 1959, and yet nationwide more money is spent on liquor alone than is spent for schools.

Teachers — by 1965 there will be a need for 350,000 more than at present. There are no signs anywhere that such an increase of qualified teachers will be available.

Time — Would an 11 or 12 month school year help the situation?

When will it be recognized that industry does not run 9 months a year? One does not cook, eat, or live on 9 months at a time. Certainly, the writer for one, does not cherish the thought of sending his children to school all year long.

The teachers certainly abhor the thought, why shouldn't they?

An 11 or 12 month school year has been tried and is now being used.

This question can become quite involved and a subject all its own.

But the rapid increase in the number of persons to be educated and the expansion in quality and quantity of the educational content naturally have their implications also for schools and their physical facilities.

The problems involved are not only more buildings, more classrooms, more equipment. Equally important and possibly more basic are such considerations as what kind of facilities are needed to serve best the many changes that appear on the horizon in the school program.

The author believes a way will be found to change the school year as it is now known. Year-round usage of school buildings must come. This would help solve many problems. Certainly that would require air conditioning.

In some of the educational seminars attended by the writer, when this problem was discussed, the immediate cry was *too costly*. Actually, it would be peanuts. When one applies third or fourth grade arithmetic to the question it disappears as a puff of smoke.

Take an average high school in Pennsylvania of 800 students. The average total cost could be approximately $3000 per student or $2,400,000 and the building is used only 9 months of the year. Would air conditioning for the other 3 months add one-third, or $1000 per student, *or* a total cost of $800,000? Of course, it must be recognized that operating a school 11 or 12 months would involve more than the original cost of air conditioning, but I am certain the saving on the additional total expenditures involved would be considerable. I also believe that when the parent and taxpayer review the many ramifications with their advantages and disadvantages, they, too, will agree and accept a change of the school concept.

Future Mechanical Conditioning

Now let's gaze into the crystal ball and observe one idea of mechanical conditioning of a classroom.

Mechanical conditioning involves the tempering, humidifying, sanitizing, and distribution of the air envelope in which one lives. Radiation transfer to and from surroundings is an important factor. Improper design resulting in heat and chill, drafts, distracting noise, lingering odors, and stagnation must be eliminated. It is often said that when the occupant is completely unaware of the system one has the ultimate. Unobtrusive but positive air movement (a basic factor in adequate air conditioning) goes one step further and makes the occupant aware — but aware rather of a general sense of well-being. It is this kind of environment which is stimulating to the educational processes.

In evaluating mechanical conditioning as applied to school building of the future, certain hypotheses spring into the writer's mind. Refrigeration cooling is here to stay. It remains only to find the proper application to the normal system. With the advent of commercial atomic reactors electricity seems to promise the most logical and economical medium of power transfer. Note that fuel is not mentioned. That is because the writer is not thinking of coal, oil, gas or even electrical resistance heating, although they could be the answer if engineered differently. Rather, the writer is thinking of the heat pump — inexhaustible power, not fuel consumption — multi-stage compression — reversible cycle, which provides refrigeration within the prime unit — elimination of waste products — compactness — air-to-air reservoir, if possible — elimination of flame as a safety hazard — forced air circulation with a semi-radiant principle.

There would be twin-pumps in each cluster or unit school, loads are not great, and capacity is adequate. With forced air circulation, response is swift. Underground electrical cable is the only service. Plenum control allows premixing to serve spaces with varying orientations. All controls are mechanical and automatic, responding to the use requirement setting of each individual space. Since the roof structure of these one-story school clusters is probably a space frame with well-insulated deck above, a flexible plastic or composition tubing which is its own insulation is seen snaking through this framing in the shortest distance between points. There are no mechanical joints or elbows — runs of tubing are lengthened or shortened by a welding or fusing process. Removable ceiling tiles give access at any point. Flexibility is achieved when room partitions are moved by re-directed tube runs and relocated ceiling diffusers. Couple this with runs under the slab-on-grade to perimeter outlets which remain fixed under fenestration, and heat leakage provides a semi-radiant system above and below. This becomes feasible only in cluster arrangement where no intermediate spaces are passed between the space to be served and the central utility core. All direct treatment, humidifying, cleaning, mixing, and quantity control is done in a twin-plenum arrangement.

With the present knowledge of solar radiation and how to control it, the writer thinks it could be designed to augment the heating system described. This would require an inbreeding of solar radiation with the heat pump.

Conclusion

This may seem somewhat sketchy in outline, but it is hoped that it gives, if not direction to your thought, at least stimulation toward drawing one's own conclusions. Future schools will not be the same as the schools of today — needs will differ. The key words to remember are *variety* and *flexibility*. On the other hand, technology moves ahead. New methods and materials requiring designed application are ever presenting themselves. The possibilities in our *Atomic Age* are unlimited.

Come to Minneapolis

Lake Harriet

ASHAE-*ASRE* Advance Plans for Twin Meetings in Twin Cities

This June the proponents of heating, ventilating, air-conditioning and refrigeration will travel to Minnesota from all parts of the United States and Canada.

Beginning June 23 the Semi-Annual Meeting of ASHAE will open in the Pick-Nicollet Hotel and the 54th Annual Meeting of *ASRE* will get underway on the same day in the Leamington Hotel.

The ASHAE Semi-Annual Meeting program tentatively consists of 5 Sessions including 9 Papers and 2 Symposiums. *ASRE* plans to hold 3 Technical Sessions with 9 Papers on various subjects. In addition *ASRE* will have a Domestic Refrigeration Engineering Conference Monday morning and 6 Forums on Tuesday afternoon.

Several Joint Sessions are contemplated: Tuesday morning, June 24 — ASHAE-*ASRE* Joint Symposium on Insulation — Pick-Nicollet Hotel; Tuesday afternoon, *ASRE*-ASHAE Joint Conference on Air Conditioning — Leamington Hotel; Wednesday morning, June 25 ASHAE-*ASRE* Joint Symposium on Condensing Methods — Pick-Nicollet Hotel; Wednesday afternoon, *ASRE*-ASHAE Joint Conference on Education — Leamington Hotel.

The ASHAE Minneapolis Chapter Committee on Arrangements, J. S. Locke, general chairman, and the *ASRE* Twin Cities Section Committee on Arrangements, V. D. Wissmiller, general chairman, are developing an outstanding program of joint special events. Things get underway Sunday afternoon at 3:30 o'clock with an ASHAE reception, then in the evening beginning at 9 o'clock *ASRE* will hold a reception and Aquatennial Preview at the Leamington Hotel. Monday morning both Societies will have *get-acquainted* or *coffee hour* socials for the ladies. A joint sight seeing trip is planned for the ladies, both organizations will hold separate Welcome Luncheons and the afternoon will be free for the men's golf outing at Golden Valley Country Club. In the evening ASHAE will hold a *County Fair* at Lake Minnetonka with special transportation planned to the fair grounds. *ASRE* members and guests, of course, are invited to the ASHAE function.

Although committee meetings and technical sessions will occupy the men's time through Tuesday and Wednesday the local committees have planned many more joint activities for the ladies and children. On Tuesday evening there will be a joint ASHAE-*ASRE* Banquet.

The Minneapolis Chapter urges you to make your plans now for a wonderful week in the *land of lakes*. Send in reservation forms promptly and make hotel reservations early.

Downtown Minneapolis business section

PROGRAM — SEMI-ANNUAL MEETING

Pick-Nicollet Hotel **Minneapolis, Minn.**

June 23-25, 1958

(All meetings and events at Pick-Nicollet Hotel unless indicated otherwise)

Saturday — June 21

Committee Meetings

Sunday — June 22

10:00 a.m. REGISTRATION
1:30 p.m. Council Meeting
2:00 p.m. Research Executive Committee
3:30 p.m. Reception — Hospitality Time (*Junior Ballroom*)
9:00 p.m. Reception — Aquatennial Preview. (*ASRE* — Leamington)
(ASHAE Members and guests are cordially invited)

Monday — June 23

9:00 a.m. REGISTRATION
9:00 a.m. FIRST SESSION
Call to Order — Pres. E. R. Queer
A Water Cooled Luminaire in a Panel Air System, by W. F. Spiegel
Pulsations in Residential Gas Furnaces with Multiple-Port Burners, by A. A. Putnam
Evaluation of Air Cleaners for Air Conditioning and Ventilation, Part I — Apparatus, by K. T. Whitby, A. B. Algren, R. C. Jordan, and J. C. Annis
9:30 a.m. Ladies' "Get Acquainted Brunch" (*Junior Ballroom*)
9:30 a.m. Children's Tour to Como Park Zoo, State Capital and University of Minnesota Campus. Includes lunch at Capital
11:00 a.m. Ladies' Trip to Southdale — nation's largest shopping center under one roof
12:00 noon Welcome Luncheon (*Lakeland*)
12:00 noon ASHAE Golf Tournament at Golden Valley Country Club (*ASRE* members and guests invited)
5:00 p.m. ASHAE "County Fair"
(*ASRE* Members and guests are cordially invited)

Tuesday — June 24

9:00 a.m. REGISTRATION
9:00 a.m. SECOND SESSION
Call to Order — 1st Vice Pres. A. J. Hess
Winter Infiltration Through Swinging-Door Entrances in Multi-Story Buildings, by T. C. Min
Corrosion Inhibition on Tubes in Low-Pressure Steel Boilers, by W. A. Keilbaugh and F. J. Pocock
Heat Gain Through Windows Shaded by Canvas Awnings, by Necati Ozisik and L. F. Schutrum
9:30 a.m. THIRD SESSION
Call to Order — 2nd Vice Pres. Walter A. Grant
SYMPOSIUM ON THERMAL INSULATION — Joint with *ASRE*
P. N. Vinther, *Symposium Manager*
M. W. Keyes, *Moderator*
Reflective and Bulk Insulation, by William Tuberville
Block and Pipe Insulation, by R. B. Crepps
Vapor Problems in Thermal Insulation, by N. B. Hutcheon
Thermal Insulation for Nuclear Systems, by G. W. Pomeroy
Surfacings for Glass Fiber and Foam Thermal Insulation, by W. P. Ellis
10:00 a.m. Bus Trip and Children's Swimming Party
10:30 a.m. Joint ASHAE-*ASRE* visit for The Ladies to Betty Crocker Kitchens and new General Mills Headquarters Building followed by a luncheon at the Wayzata Country Club
1:00 p.m. *ASRE* Golf Tournament, Edina Country Club (ASHAE members and guests invited)

HOTEL
NICOLLET

ASHAE Headquarters Hotel

2:30 p.m. *ASRE* Conference on Air Conditioning — (*Leamington Hotel*). Joint with ASHAE
6:30 p.m. Cocktail Party — *ARI* Host (*Leamington Hotel*).
7:30 p.m. Joint Dinner (*Leamington Hotel*).
Presentations
Followed by dancing

Wednesday — June 25

9:00 a.m. REGISTRATION
9:00 a.m. FOURTH SESSION
Call to Order — Treas. J. H. Fox
SYMPOSIUM ON CONDENSING METHODS — Joint with *ASRE*
W. G. Hole, *Symposium Manager*
A. J. Hess, *Moderator*
Cooling Tower Design and Performance, by John Engalitcheff
Evaporative Condensers, by D. D. Wile
Air Cooled Condensers, by Otto Nussbaum
Economic Evaluation of Condensing Methods, by J. L. Wolf
9:00 a.m. FIFTH SESSION
Call to Order — Pres. E. R. Queer
Activated Charcoal for Air Purification, by H. L. Barnebey
Cooling Load from Pretabulated Impedances, by Harry Buchberg
Solar Energy Utilization for Heating, Cooling, Distillation and Drying — prepared by TAC on Solar Energy Utilization
Report of Resolutions Committee
Unfinished Business
New Business
Adjournment
1:00 p.m. Ladies' Card Party (*Birchwood*)
1:30 p.m. *ASRE* Conference on Education (*Leamington Hotel*). Joint with ASHAE
1:30 p.m. Children-Supervised visit to CINERAMA

Note: There will be a children's hospitality room open at the hotel during meeting hours featuring TV, record player, games and magazines. With supervisors. Also for children of school age. Sitters available.

John E. Haines
Honorary Chairman

J. S. Locke
General Chairman

J. H. Jester
Chapter President

F. B. Rowley
Honorary Chairman

G. M. Kendrick
Vice Chairman

MINNESOTA CHAPTER

COMMITTEE ON ARRANGEMENTS

Semi-Annual Meeting

June 23-25, 1958 Minneapolis, Minn.

J. F. Siegel
Vice Chairman

BANQUET — L. C. Gross, *Chairman*

CHILDREN — R. M. Jack, *Chairman*, Mmes. R. M. Jack, T. R. Turnham, R. E. Warner, A. M. Larsen.

ENTERTAINMENT — J. L. Hanson, *Chairman*, Mrs. John E. Haines, Mrs. W. J. Ortman, J. W. McNamara, R. G. Gridley, Lin J. Krause, C. L. Benson, H. C. Mills, W. J. Ortman.

FINANCE — V. E. Pearson, *Chairman*, Ralph Etnier, O. L. Lilja, C. T. Olson, R. A. Nelson, R. L. Peterson.

LADIES — S. L. Furber, *Chairman*, Mrs. S. L. Furber, Co-Chairman, Mmes. J. A. Craig, J. F. Cummiskey, J. S. Locke, Mrs. G. M. Kendrick, B. F. McLouth, V. E. Pearson, H. G. Sierk, William Sturm.

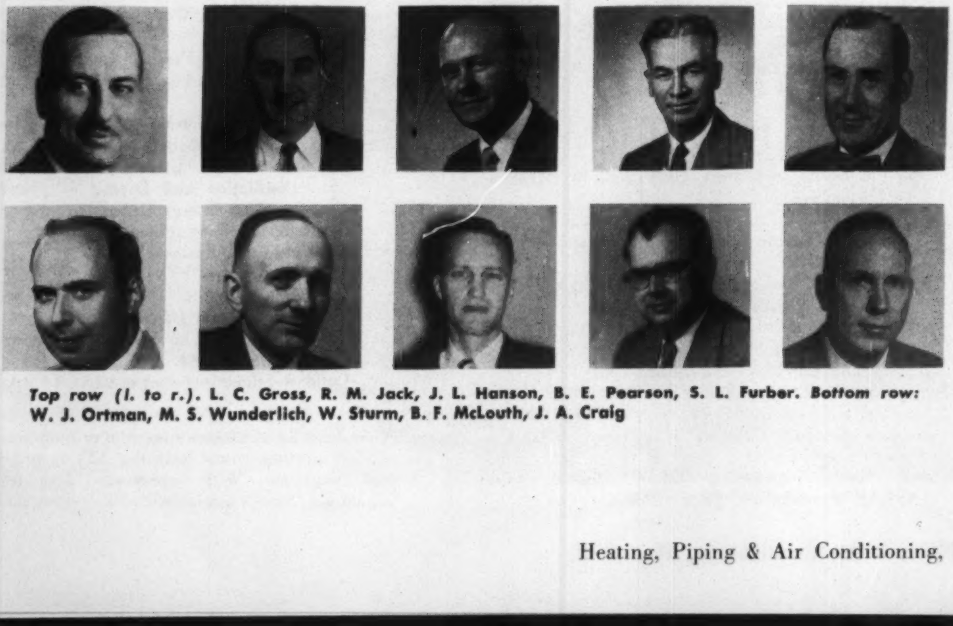
PUBLICITY — W. J. Ortman, *Chairman*, J. Robert Snyder.

RECEPTION — M. S. Wunderlich, *Chairman*, A. B. Algren, R. E. Backstrom, G. B. Brown, L. F. Flagg, D. M. Forfar, J. K. Gerrish, L. L. Lierboe, B. C. Mulcahy, E. P. Palmer, E. J. O'Donnell, E. F. Snyder, Jr.

SESSIONS — William Sturm, *Chairman*, C. B. Ashenfelter, L. D. Freedland, Warren Stanchfield, E. J. Baker, Julian Sjordal, A. W. Wessel, J. R. Andrews.

SPORTS — B. F. McLouth, *Chairman*, Lyman Hyde, E. A. Monies, E. J. O'Donnell, C. T. Hastings, M. E. Quigley, M. B. Kispert, T. A. Perry, E. R. Huckins, Chester Dock.

TRANSPORTATION — J. A. Craig, *Chairman*, R. H. Griffiths, H. J. Mahanns, C. E. Wiser.



Top row (l. to r.). L. C. Gross, R. M. Jack, J. L. Hanson, B. E. Pearson, S. L. Furber. Bottom row: W. J. Ortman, M. S. Wunderlich, W. Sturm, B. F. McLouth, J. A. Craig

Glaciers and Climate — Nature's Heat and Mass Transfer Problem

By Peter A. Schoeck, Little America, Antarctica

SUMMARY — The subject of this article is a real departure from man-made air conditioning. It is, however, a most interesting briefed discussion of how natural conditions are changing on this planet. The author, an instructor of mechanical engineering at the University of Minnesota on leave of absence, is Chief Glaciologist and Antarctic Scientific Discipline Chief for Aurora and Airglow at Little America, Antarctica. The work described is under contract with the Arctic Institute of North America for participation in Polar Research during the International Geophysical Year.

APPROXIMATELY 10 percent of the land on the earth is continuously covered with ice and snow of which area 87 percent is located in the Antarctic and 12 percent in Greenland (Bauer, 1955).

Study of the behavior of the glaciers in their relation to present climatic conditions and possible climatic changes is of more than academic interest, for melting of the polar glaciers would raise the level of the oceans approximately 200 feet, resulting in world wide economic consequences. Of not less importance is knowledge of the behavior of the relatively small glaciers of the lower latitudes since they act as natural water reservoirs and their existence is prerequisite for the civilization of wide areas.

Owing to seasonal variations, glaciers undergo a periodic mass and energy exchange with their surroundings. During the accumulation period they grow in size due to increased snow fall. During the ablation period they shrink primarily by melting followed by drain-off of the meltwater. If a glacier is in annual mass equilibrium the annual ablation equals the annual accumulation.

Temperatures within a glacier are in general not in equilibrium. Annual fluctuations of the surface temperature penetrate with decreasing amplitude downwards from the surface. At a depth of approximately 30 ft, practically, the mean annual surface temperature is read throughout the year in the Antarctic ice sheet and parts of the Greenland ice cap. The boundary conditions on the bottom are given by the heat flow from the interior of the earth and by the frictional heat produced by the movement of the ice over its bed.

Only the so-called temperate glaciers of the lower latitudes show an approximate temperature equilibrium near the melting point at least during the ablation period.

For more than 100 years the majority of all glaciers accessible to observers showed an almost continuous retreat. It has not been possible to explain this phenomenon by one common climatic cause. The response of a glacier to a certain climatic change can only be understood by a detailed study of its mass and heat budget. Of particular interest in this connection is the energy equation of the surface which may be written in the following form:

$$Q = \alpha_s Q_{rs} + \alpha_L Q_{rL} + Q_c + Q_l + Q_s$$

where

Q = net heat flow through the surface per unit time.
Q_{rs} = heat flow due to short wave radiation.
Q_{rL} = heat flow due to long wave radiation.
Q_c = heat flow by convective transfer from the air.
Q_l = latent heat connected with mass transfer.
Q_s = sensible heat connected with mass transfer.
α_s = absorptivity for short wave (solar) radiation.
α_L = absorptivity for long wave radiation (surface and atmosphere).

Heat flow into the glacier is considered as positive; heat flow from the glacier to the surroundings as negative.

For radiation at temperatures common on earth, snow and ice have black body properties. Hence $\varepsilon_l = \alpha_L = 1$ where ε_l represents the emissivity. For short wave (solar) radiation the absorptivity α_s varies strongly with grain size, porosity and free water content of the surface, with the angle of incidence and to a slight degree with the spectral composition of the solar radiation which depends on the cloud cover.

While ice may absorb up to 80 percent of the incoming solar radiation, the absorptivity of snow can become as low as 0.1. Most significant is the increase of α_s as soon as the snow surface starts to melt. Then α_s reaches values between 0.6 and 0.7. As a consequence the energy input increases rapidly.

From a comparison of the heat of fusion with the heat of vaporization it is evident that the ablation must increase rapidly as soon as the melting temperature has been reached by the ice or snow, provided that the meltwater can drain off and has no chance to refreeze. No case is known to this writer where vaporization contributes significantly to the ablation.

Hoinkes and Untersteiner (1952) investigated the energy and mass balance of glaciers in the European Alps. They found that the energy necessary to melt the equivalent of the annual accumulation is primarily supplied by solar radiation (60 to 85 percent) while convection (15 to 30 percent) and heat supplied by condensation of water vapor on the surface (5 to 15 percent) are of less importance. Hoinkes could explain glacier variations in the European Alps during the past 60 years by corresponding variations of duration of sunshine and absorption of solar radiation.

The results of Sverdrup's (1935) and Wallen's (1948) studies of glaciers in Spitzbergen and Northern Scandinavia show that the heat transfer by convection from the air is of equal or greater importance than the radiation in higher Northern latitudes. Only in places where the surface conditions imply high absorption of solar radiation does radiative heat transfer exceed the convective heat transfer. The heat transfer by condensation may amount to 25 percent of the total net heat flow during the ablation period in the relatively humid maritime climate of the Arctic.

The retreat of the Arctic glaciers as well as the recession of the Arctic sea ice which resulted in a marked improvement of the navigation conditions during the past decades is very likely connected with an increase of the meridional mass exchange of the atmosphere. This results in earlier melting of the surface in the spring and consequently in larger absorption of solar energy.

Increased cloudiness resulting from longer atmospheric circulation provides a natural *greenhouse effect.* Thus the total radiation balance is, in general, positive in the presence of an overcast. Furthermore, it is significant for the radiation conditions over large snow covered glaciers that a thin cloud cover decreases the incoming short wave radiation to a much smaller degree than is usually the case. This is due to multiple reflections between snow surface and cloud cover apparent to the polar traveller by the bright color of the overcast sky (ice blink).

Conditions in the Antarctic are quite different from those in the North Polar regions. The symmetric position of the Antarctic continent with respect to the geographic pole results in a much lower surface and air temperature than in the Arctic where heat is conducted through a relatively thin ice layer from the ocean to the atmosphere. Due to the low moisture content of the air the incoming solar radiation is relatively high during the summer. The global short wave radiation reaches values of over 80 percent of the radiation without atmosphere (Liljequist 1953). However, the cold fine grained snow reflects approximately 90 percent of the incoming short wave radiation. The total monthly radiation balance is thus negative throughout the year except for possibly one or two months during the midsummer.

Data representative for the convective heat transfer in the interior of the Antarctic continent are not yet available. Loerve (1956) estimated from wind velocities and cooling of the air that the convective heat transfer must approximately compensate for the annual radiative heat loss. Vaporization can at the most dispose of a few inches of snow per year while the annual accumulation, although much less than in the Arctic, is a multiple of this value. Melting on the surface is minimal.

There is evidence that the Antarctic ice sheet is at the present time in mass equilibrium. A change of the mass budget of the Antarctic ice sheet seems only possible by an increase of the meridional atmospheric mass exchange. A rise of solar radiation alone would have very little effect as long as the surface stays below freezing temperature. How far the precipitation would increase with larger atmospheric circulation can hardly be predicted.

A detailed study of the glaciers in the Arctic and the Antarctic is being conducted during the International Geophysical Year. It is hoped that the results will contribute to a better understanding of the ice on this planet and its relation to climate.

ACTIVITIES OF SOCIETY CHAPTERS

The first Chapters Regional Committee Meeting for 1958 was held in New York and featured a fine attendance. Many issues were discussed including the ASHAE-ASRE Merger Plan. New York Chapter was host. Meanwhile, many chapters throughout the country and Canada heard various technical and non-technical talks.

First 1958 Regional Meeting Held

More than 40 members, alternates, officers and other guests attended the Chapters Regional Committee Meeting of Region 1, at the Hotel Roosevelt, New York, N.Y., on March 17. The luncheon and host chapter dinner drew some 75 persons. All Officers were in attendance: Pres. E. R. Queer, University Park, Pa., First Vice

AMERICAN SOCIETY
OF
HEATING AND
AIR-CONDITIONING
ENGINEERS

Society Officers and New York Chapter officers at Region 1 meeting. (*l. to r.*) *Seated:* John H. Fox, treasurer; Walter A. Grant, 2nd vice president; E. R. Queer, president; and A. J. Hess, 1st vice president. *Standing:* John Everetts, Jr., former director of Region 1; W. M. Heebner, W. J. Olvany, J. B. Hewett, C. R. Hiers, L. V. Carr

Guests at the Region 1 meeting in New York. (*l. to r.*) *Seated:* J. W. McA. Kruettner, Sherman Loud; Walter L. Fleisher and Alfred J. Offner, past presidents of Society; Carl F. Kayan, A. D. Winston. *Standing:* W. O. Huebner, D. C. Lindsay, E. K. Stevens, C. M. Wilson, D. L. Mills, C. S. Pabst, R. C. Cross, A. A. Bearman

Pres. A. J. Hess, Los Angeles, Calif., Second Vice Pres. W. A. Grant, Syracuse, N.Y., Treas. J. H. Fox, Toronto, Ont., Can., and A. V. Hutchinson, executive secretary as well as Council Member John Everetts, Jr.

F. H. Faust, regional director of Region 1 who was to conduct the meeting, attended an informal session of the Committee on the preceding night, but was stricken with German measles on the morning of the meeting and returned to his home. Mr. Everetts, former director of Region 1, took over for Mr. Faust and conducted the meeting. Mr. Everetts appointed a committee composed of S. F. Gilman, Syracuse, N. Y., E. K. Wagner, Philadelphia, Pa., and J. K. Thornton, Johnstown, Pa., to draw up an expression of sympathy to Mr. Faust.

C. R. Hiers, president of New York Chapter, extended a welcome to the group. L. D. Carr, was named secretary of the committee and P. A. Bourquin, was named assistant secretary. The group engaged in an extensive discussion of the proposed ASHAE-*ASRE* Merger Plan with President Queer and other officers taking part. R. C. Cross, Executive Secretary of *ASRE* and a guest at the meeting, gave an informal talk on *ASRE* operation. President Queer lauded the excellent cooperation of the secretaries from both societies in developing a program. President Queer discussed the background of the merger plan and told the members and alternates to consult their regional directors on all merger problems. Mr. Hess discussed the division of regions under the new plan, officers duties and responsibilities, dues structure and publications. At the luncheon, Past Presidents W. L. Fleisher, Alfred J. Offner and P. B. Gordon, were introduced, along with E. K. Stevens, International Exposition Co. Mr. Hess was luncheon speaker and discussed, *Third Year of the Society's Regional Plan.*

At an Executive Session in the afternoon, E. K. Wagner, Philadelphia Chapter, was named Member to the Society Nominating Committee; L. A. Childs, Central New York Chapter was named first alternate to the committee and G. Donald Fife was named second alternate. An invitation was extended by Western New York Chapter to hold the 1959 Region 1 meeting in Buffalo, and North Jersey Chapter issued an invitation to hold the meeting in the North Jersey area as an alternate location. Following the Executive Session a general discussion was held on Chapter Affairs. Preceding the dinner, President Queer discussed, *General Conditions of the Society* and *Latest Developments of the* ASHAE-*ASRE Merger Plan.* This was followed by the New York Chapter Meeting, the introduction of Society Officers, Council Members, Host Chapter Officers and their wives. President Queer was principal speaker of the evening and gave an illustrated talk on, *Industrial Air Conditioning of Underground Storage.*

Technical Talks at Chapters

An interesting talk on *Design and Application of Dual-Duct Systems* by David Rickelton, sales engineer, Buensod-Stacey, Inc., Charlotte, N. C. was heard by members and some 30 guests of ATLANTA Chapter at a joint meeting with *ASRE.* A question and answer period followed. • • • J. W. May, regional director of Region 5 was given a standing ovation at a meeting of BLUEGRASS Chapter when the announcement was made that he had been elected to Council. A detailed analysis of the *Residential Application of Waterless Air Conditioning* was given by George Higganbotham, Airtemp Division, Chrysler Corp., Dayton, Ohio. • • • P. J. Marschall, regional director of Region 2 recently addressed the CENTRAL OHIO Chapter. Mr. Marschall

Delegates and alternates at Regional Meeting of Region 1 held Hotel Roosevelt in New York, March 17, 1958 (*l. to r.*) *Seated:* W. C. Martin, Jr., S. F. Gilman, F. A. Ferraro, E. K. Wagner, C. W. Stone, C. J. Forve, J. K. Thornton, L. G. Huggins. *Standing:* R. F. Curry, R. B. Cahoon, C. M. Alston, H. J. Campbell, Jr., C. R. Munn, J. P. Guerra, E. H. Riesmeyer, Jr., R. B. Taylor, J. B. Hewett, C. R. Hiers, S. H. Nitzberg, K. O. Schlentner.

JOURNAL SECTION

brought the group up-to-date on headquarter's activities and gave a brief history of the Society including important milestones. • • • A panel discussion on *Automatic Controls* was held by CONNECTICUT Chapter recently. The panel was moderated by D. M. Hummell, manager, Division of Engineering, Department of Business Management, Yale University. Participants and their subjects were: W. A. Young, product manager, Barber-Colman Co., Rockford, Ill., *Electronic Controls;* Norman Janissee, assistant chief field engineer, Johnson Service Co., Milwaukee, Wis., *Pneumatic Controls;* C. M. Sanders, product manager, Commercial Division, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., *Combination Pneumatic-Electronic Systems.* • • • Forced Hot Water Systems was the subject of a talk by Frank Gall, manager, Heat Transfer Department, Bell & Gossett Co., Morton Grove, Ill., before members of ILLINOIS-IOWA Chapter. A lively question and answer period followed. • • • A discussion on Modern Pipe and Equipment Insulation was given before members and guests of JACKSONVILLE Chapter. The speaker was S. L. North, president, North Bros., Inc., Atlanta, Ga. • • • D. B. Rentschler of Sporlan Valve Co., St. Louis, Mo., discussed *Thermostatic Expansion Valve Application* before members and 27 guests of KANSAS CITY Chapter. • • • An illuminating talk on *Vibration, Shock and Noise Control for Air Conditioning Equipment* was given by Jack Harris, chief engineer, Korfund Co., Inc., Long Island City, N. Y. before members and guests of LONG ISLAND Chapter. A question and answer period followed. • • • An informative discussion of the *Interpretation of Memphis Gas Heating Codes* was heard by members of MEMPHIS Chapter. Discussion leaders were C. W. May and L. Forrest White of the Gas Division of the Memphis Light, Gas and Water Division, Memphis, Tenn. A special display to demonstrate methods and limitations in designing and sizing gas piping was presented. • • • A general discussion on pipeline expansion and the use of packless expansion joints was given by George Hipple of Flexonics Corp., Maywood, Ill., at a meeting of MICHIGAN Chapter. • • • A most interesting and informative talk on *Acoustical Problems Associated with Ventilating and Air Conditioning Systems* was presented by R. B. Newman, vice president of Bolt Bernaek and Newman, Inc., Cambridge, Mass., at a meeting of MINNESOTA Chapter. • • • A NORTH JERSEY Chapter meeting featured a talk on *Heat Gain Calculations by the Thermal Response Method* by W. R. Briskin, manager Advanced Engineering Department, General Electric Co., Bloomfield, N. J. A lengthly discussion period followed Mr. Briskin's talk. At another meeting of NORTH JERSEY Chapter, F. H. Faust, recently elected to Council and Regional Director of Region 1, was presented with a leather briefcase in appreciation of his outstanding service to the chapter from the time of its organization. • • • Members and guests of NEW MEXICO Chapter heard W. L. Batchelor, chief engineer, Tuttle & Bailey, New Britain, Conn., discuss sound ratings of heating and ventilating equipment. • • • A recent NEW YORK Chapter meeting featured a panel discussion on the *New Refrigeration Code and Ventilation Rules.* A. A. Giannini, district manager, Carrier Corporation, New York, N. Y. was the moderator. H. J. Ryan, president, Harold J. Ryan, Inc., Long Island City, N. Y., explained questions on the *Refrigeration Code* and P. B. Gordon, immediate past president of the Society answered questions on Ventilation Rules. • • • An interesting illustrated talk on the *Design and Application of Remote Air Cooled Condensers* was presented before members and 24 guests of NORTH TEXAS Chapter. The speaker was S. C. Segal, general sales manager, Kramer-Trenton Co., Trenton, N. J. A question and answer period followed. • • • A speaker at a meeting of NORTHERN OHIO Chapter was P. J. Marschall, Regional Director of Region 2. Mr. Marschall gave a rundown on the Society's activities and budget on the regional and national levels. Mr. Marschall, who is chief engineer of Abbott Laboratories, North Chicago, Ill., also addressed the chapter on *Industrial Ventilation.* The talk was followed by an enlightening question and answer period. • • • NORTHERN PIEDMONT Chapter was host to the Carolina Section of *ASRE* at a recent meeting. The two groups heard David Lawson, Sporlan Valve Co., St. Louis, Mo., speak on *Moisture and Its Effects.* • • • J. H. Fox, treasurer of ASHAE, recently discussed the proposed ASHAE-*ASRE* Merger Plan before members of ONTARIO Chapter. The group also heard Paul Ostergaard, Carrier Corporation, Syracuse, N. Y. on *Transmission of Sound.* • • • A most interesting talk was given before members and guests of OREGON Chapter by John Hansel, sales engineer, General Electric Co., Schnectady, N. Y. Mr. Hansel used charts and diagrams in giving general elementary definitions of electrical terms and the types of basic electrical flow such as DC, single phase AC and three phase AC. He also elaborated on the various types of motors used in heating and air conditioning and described various motor control systems. • • • An informative talk on *Comparative Gas and Electric Usages* was given before members and 63 guests of PITTSBURGH Chapter by C. A. Brandt, Houston Natural Gas Corp., Houston, Tex. The illustrated talk explained the financial advantages of gas over electric when being used for appliances, heating, cooling, etc. • • • *The Design and Application of Remote Air Cooled Condensers* was the feature of a recent SOUTH TEXAS Chapter meeting.

TOLEDO CHAPTER AWARDED WINDOW PLAQUE

American Society of Heating and Air-Conditioning Engineers
Founded 1894
Health
Comfort & Recreation
Manufacturing
Education

Toledo Chapter receives first place plaque, second consecutive year, in the Engineers' Window Display Contest. Robert Greenwald, president of Chapter, accepted the plaque at the Seventh Annual Banquet sponsored by the *Toledo Technical Council* in cooperation with *Toledo Society of Professional Engineers.* The winning window arrangement was an activity of the Chapter's Publicity Committee: K. L. Tyler, chairman; C. W. Stoneking, D. J. Vild, R. H. Wadsworth

The speaker was S. C. Segal, general sales manager, Kramer-Trenton Co., Trenton, N. J. • • • WASHINGTON D. C. Chapter members heard a most interesting talk on *Respirable Atmospheres and Sealed Chambers* by Dr. Harry J. Alvis, captain, Medical Corps, U. S. Navy. Dr. Alvis mentioned some of the problems of the present *Nautilus* and other modern submarines and discussed cooling, heating and air purification methods used. • • • An interesting discussion on *The Absolute Filter* was given before members of WEST TEXAS Chapter by David Halley, J. R. Dowdell & Co., Lubbock, Tex. • • • *Cooling Problems of Classrooms* was the topic of an illustrated talk by Henry Wright, consultant, Herman Nelson Corp., New York, N. Y., before members of WESTERN NEW YORK Chapter.

Other Chapter Activities

An informative talk on *Better Schools for Better Education* was heard recently by members of CENTRAL NEW YORK Chapter. The speaker Z. A. Marsh, market sales manager, schools and colleges, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., supplemented the lecture with colored slides. Members and guests of EMPIRE STATE CAPITAL Chapter recently were treated to an extremely interesting tour through the General Electric Co.'s Research Laboratory at the Knolls. Many little known facts were discussed about the operation of the plant. • • • A standing ovation was accorded to outgoing president C. Rollins Gardner of FORT WORTH Chapter for his extremely well done job of guiding the chapter in its initial year. President T. B. Romine, Jr., as his first act, presented Mr. Gardner with a certificate of appreciation. • • • *The Air Conditioning System at United Shoe Machinery Building*, Boston Mass., was the subject of a talk before members of MASSACHUSETTS Chapter. The speaker was Wesley Ehrenzeller, vice president of A. Ehrenzeller, Inc., Dorchester, Mass. • • • NORTHERN ALBERTA Chapter heard a most interesting talk on *Weather* by Dean H. Smith, chief meteorologist of the Department of Transport. • • • A life membership certificate was presented to Frank X. Loeffler, Sr., at a recent meeting of OKLAHOMA Chapter. Despite snow and ice some 55 members and guests attended the meeting to see Mr. Loeffler receive his gold card. He is acknowledged as the founding father of the OKLAHOMA Chapter. Twelve of the sixteen living past presidents of the chapter were in attendance. • • • A tour of the Penn-Sheraton Ho-

CHAPTERS REGIONAL COMMITTEE FOR REGION 5 MEETS IN WASHINGTON

At the meeting of the Chapters Regional Committee for Region 5 in Washington, D.C., April 9, 1958

Some 25 officers, Council members, Members and Alternates and guests attended the Chapters Regional Committee Meeting of Region 5, held April 9, at the Sheraton Carlton Hotel, Washington, D.C. Distinguished guests included Society Pres. E. R. Queer, 2nd Vice Pres. Walter A. Grant, Council Member, G. B. Priester, and Washington D.C. Chapter Past Presidents, G. W. Campbell and J. H. Broome. The meeting was conducted by Regional Director James W. May, Louisville, Ky., and the morning session was devoted to welcome comments by the host chapter (Washington, D.C. Chapter). A discussion of the proposed ASHAE-*ASRE* merger plan, led by Pres. E. R. Queer, University Park, Pa., and a discussion on various chapter agenda items. L. D. Pain, secretary of the Washington, D.C. Chapter was appointed secretary of the meeting. Following the luncheon, President Queer spoke on *General Conditions of the Society* and *Latest Developments of the* ASHAE-*ASRE Merger Plan.*

At an Executive Session in the afternoon R. K. Rouse of Greenville, was named Member to the Region 5 Nominating Committee and W. B. Robertson, Jr., Baltimore, was named First Alternate and Olan J. Hill, Bluegrass Chapter, was named Second Alternate. An invitation to hold the 1959 Chapters Regional Committee Meeting of Region 5 in Greensboro, N. C., was extended by Northern Piedmont Chapter with an alternate invitation from Southern Piedmont Chapter to hold a meeting in Charleston, S. C. Bluegrass Chapter asked that first consideration for the 1960 Chapters Regional Committee Meeting be given to Louisville. The meeting was concluded with a discussion on Chapter Affairs having to do with improved operations of chapters and such items as publications, dues structure, meetings, speakers, and membership.

A social hour followed at the Occidental Restaurant, in Washington, D.C., where an excellent dinner was served to more than 100, including members of the host chapter. Dinner speaker was H. M. Hock, Federal Coal Mine Inspector, U.S. Bureau of Mines, whose topic was the *Magic of Fire.* Host chapter members in charge of the program were: J. W. Morgan, chairman, H. Jack Rush and L. D. Pain. The accompanying photographs on this page were taken through the courtesy of Louis Laforet, member of Washington, D.C. Chapter.

AT REGIONAL MEETING IN WASHINGTON, D.C.

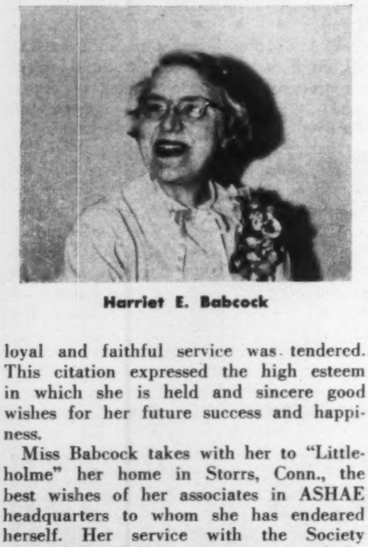
Society Officers, Council members and guests attending the Region 5 Chapters Regional Committee Meeting, April 9, The Sheraton Carlton Hotel, Washington, D.C. *(l. to r.) Seated:* J. W. May, regional director of Region 5; Pres. E. R. Queer, G. B. Priester, member of Council; Walter A. Grant, 2nd vice president. *Standing:* G. W. Campbell and J. H. Broome, both past presidents of Washington, D.C. Chapter (host chapter to the meeting); L. D. Pain, secretary of Washington, D.C. Chapter, and L. A. Laforet

tel recently was enjoyed by members and guests of PHILADELPHIA Chapter as part of its Ladies Night program. • • • *Twelve Months Operation of Schools* was the subject of a talk before a meeting of ST. LOUIS Chapter and ASRE. The speaker was Z. A. Marsh, market sales manager, schools and colleges, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. Members of the school boards from nearby school districts also attended the meeting.

HARRIET BABCOCK LEAVES ASHAE STAFF

April 1, 1958 marked another milestone in ASHAE records and in the career of Miss Harriet E. Babcock when she concluded her work with the Society after 33 years of service. She has enjoyed a wide acquaintanceship among Society members, having worked in membership, publications and in fund-raising for research.

At the Council meeting on April 20 in Milwaukee, Wis., a fine tribute to her loyal and faithful service was tendered. This citation expressed the high esteem in which she is held and sincere good wishes for her future success and happiness.



Harriet E. Babcock

Miss Babcock takes with her to "Littleholme" her home in Storrs, Conn., the best wishes of her associates in ASHAE headquarters to whom she has endeared herself. Her service with the Society spanned one half of its existence and she was a participant in its growth from a group of 1800 members to its present strength of 11,900. During her years of service she saw many of the important milestones in the Society's progress; the change in the monthly JOURNAL, the growth of the HEATING, VENTILATING, AIR CONDITIONING GUIDE from a volume of 524 pages and a distribution of 6,000 to a world renowned reference book of 1800 pages and a circulation of 19,250 copies. She helped in the 50th Anniversary celebration of the founding of the Society and more recently saw change in its corporate name from ASHVE to ASHAE.

It was an active period of over 3 decades and Miss Babcock says that she enjoyed every minute of it.

Members and alternates sent by the chapters of Region 5 to the Chapters Regional Committee Meeting of Region 5, at Washington, D.C., April 9. (l. to r.) *Front:* D. L. Gusler, Virginia; R. L. Reiley, Savannah; J. S. Edgar, Atlanta; J. E. Hart, Northern Piedmont. *Center:* F. M. Hewitt, Baltimore; J. H. Maloney, Delta; W. P. Wells, Southern Piedmont; H. W. Jack Rush, Washington, D.C.; H. L. Carr, Bluegrass. *Rear:* B. A. Leppard and H. J. Haar, Jr., South Carolina; W. B. Moses, Jr., Delta; J. R. Clark, Southern Piedmont; G. B. Rottman, Northern Piedmont; J. W. Morgan, Washington, D.C.; L. H. Smith, Mississippi

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HONORED BY LIFE MEMBERSHIP

by recent action of Society's Council

John J. Aeberly, Chicago, Ill. • • • Chief, Bureau of Heating, Ventilation and Industrial Sanitation for the City of Chicago since 1919. • • • Was graduated from Armour Institute of Technology in 1913 with a B.S. degree, and received a C. E. degree in 1931. • • • Joined the Society in 1928. Served as president of Illinois Chapter in 1932 and later on its Board of Governors. A member of the Society's Council, 1937-39, served as a member of the Meetings Committee in 1937, and as its chairman in 1938; on Standards in 1939; and on various Special Committees: Ventilation Standards, 1931-35; Meetings Program, 1931; Engineering in Its Relation to Public Health, 1939. Was active on TAC on Air Flow Through Registers and Grilles, 1930-32; Air Conditions and Their Relation to Living Comfort, 1933-35; Air Conditioning in Treatment of Diseases, 1934-35; Heating and Ventilation in Its Relation to Health and Comfort, 1929. • • • Author of numerous articles which have appeared in magazines and trade journals. Will be elected to Life Membership in *Chicago Association of Consulting Engineers;* is a Fellow of *APHA* and a member of *Royal Society of Health,* London, England;

John J. Aeberly

Herbert E. Barth

Herbert E. Barth, Detroit, Mich.: After 43 years of service, retired on March 1, 1958, as executive vice president, American Blower Division, American-Standard, Detroit. • • • Was graduated from University of Kentucky in 1915 with a B.M.E. • • • Society member since 1920 and contributor to chapter on Fans in THE GUIDE. Associate editor of *Air Conditioning & Engineering.* • •

• Member of the *Engineering Society of Detroit,* Detroit Athletic Club, Detroit Golf Club, Pendennis Club of Louisville, Ky., 32nd degree Scottish Rite Mason and Shriner. • • • Listed in *Poor's Register of Officers & Directors.*

Walter A. Bornemann, Philadelphia, Pa.: With Carrier Corporation, Philadelphia, Pa., from 1919 to 1958. Work included drafting, estimating, and construction. Was a sales engineer for Carrier Corporation for 37 years. • • • Was born in Jersey City, N.J., and was educated at Stevens Institute of Technology, Hoboken. Also attended Lehigh University. • • • Served as a 2nd lieutenant in the U.S. Army during 1917-1919. • • • Became a member of the Society in 1923. • • • President of Valley Forge Chapter of *Pennsylvania Society of Professional Engineers.* Is listed in *Who's Who.*

Walter A. Bornemann

Albert Buenger, Cincinnati, Ohio: Consulting engineer for Cordes, Pressler, Houck & Assoc., Cincinnati. • • • Born in St. Paul, Minn. and received his education there. Attended Concordia College and the University of Minnesota where he received a B.Sc. in engineering and later an M.E. • • • Was affiliated with the Minnesota Chapter when he joined the Society in 1921. Joined the Cincinnati Chapter later where he was secretary-treasurer in 1941, vice president in 1942, and president in 1943. • • • Has been a member on numerous Society committees and Council: Research, 1933-35; Guide Publication, 1936, and chairman in 1937-38; Constitution and By-Laws, chairman, 1942; To Cooperate With Other Professional Societies, 1946; Building, 1953-55; F. Paul Anderson Award, 1956. Served on Council from 1934 to 1937. • • • Has had a paper on water heating devices published in the ASHAE Transactions. • • • Is listed in Engineers Hotel Executives, and is a member of the *Engineering Society of Cincinnati.*

Albert Buenger

Russell Donnelly

Russell Donnelly, New York, N. Y.: Was graduated from Mercersberg Academy in 1910; and from the University of Pennsylvania in 1915 with a B.S. in chemical engineering. • • • Joined Nash Engineering Co., New York, in 1921, where he is a sales engineer. • • • Before joining Nash Co., he was a designing engineer for Cuban Sugar Mills, Francisco Co., New York. • • • He became a member of the Society in 1923, and served as president of the New York Chapter, 1931-32. • • • Mr. Donnelly makes his home in New York.

Ernest E. Durbry

Ernest E. Dubry, Detroit, Mich.: Former general superintendent of Detroit Edison's Central Heating Department. • • • Retired last October after 43 years of service. • • • Received B.M.E. from University of Michigan in 1914. • • • Past president of the Michigan Chapter ASHAE and of the *National District Heating Association.* As a member of the Michigan Naval Militia in 1917 was called to active duty during World War I. • • • Is a member of the *Engineering Society of Detroit* and of the Knights of Columbus and the American Legion.

Margaret Ingels, Lexington, Ky.: Joined the Carrier Corporation, New York office, in 1917 as the first woman engineer in the field of air temperature and humidity control. • • • Received B.M.E. in 1917 and M.E. in 1920 from the University of Kentucky. • • • Joined the Society in 1918, one of the first woman members. Was secretary of Pittsburgh Chapter, 1925-27, and secretary of Central New York Chapter, 1946. • • • Served at Research Laboratory of ASHAE, Pittsburgh, 1921-27; did field tests for the New York Commission on School Ventilation, 1927-29. Returned to Carrier in 1929 in their Syracuse office, and stayed until 1952, at which time she retired. • • • Was honored with the American Legion Award for Distinguished Citizenship and an L.L.D. from the University of Kentucky. • • • Wrote *Father of Air Conditioning* in 1952 as a tribute to Dr. Willis Haviland Carrier, as well as numerous articles published in the Society's TRANSACTIONS and in leading trade publications.

Margaret Ingels

George M. Maier

George M. Maier: Mt. Lebanon, Pa. Born in Terre Haute, Indiana, and was graduated from Rose Polytechnic Institute with a B.S. in mechanical engineering. • • • Became a member of the Society in 1920. • • • Retired from his position as General Manager Heating Plants for the American Radiator and Standard Sanitary Corporation, New York, N.Y., on October 1, 1957. Started working for the Corporation in 1916 upon graduation from the Rose Institute. • • • Is a member of the Saint Clair Country Club of Pittsburgh, Pa.

Everett N. McDonnell, Chicago, Ill.: Attended Iowa State College, Ames, and was graduated from Cornell University, Ithaca, N.Y., in 1916, with an M.E. degree. • • • Became a Society member in 1932, and has been affiliated with the Illinois Chapter since. • • • Was a Council member for 8 years. Served on such Council Committees as: Finance in 1940 and chairman in 1941; Executive in 1943, and its chairman in 1945. Served as chairman, Research Finance in 1944; as a member of Guide Publication Committee from 1936-38; chairman, Laboratory Housing in 1946; chairman, business and Financial Policies in 1947. • • • Formed McDonnell & Miller, Inc., in 1924, and became sole owner and president in 1929. • • • Was the 11th recipient of the F. Paul Anderson Award in 1953 for achievement in the field of heating, ventilating, and air conditioning. • • • Is a registered professional engineer in the state of Iowa since 1920 and is listed in *Who's Who in America.*

Everett N. McDonnell

Herbert E. Paetz, Detroit, Mich.: • • • Was Division Sales Manager for American Blower Corp., Detroit, before retiring on February 1, 1958. • • • Attended Purdue University and received B.S.M.E. in 1919. • • • Has been with the Society since 1922. Served as president of Michigan Chapter in 1933. • • • Member of Essex Golf Club, Sigma Alpha Epsilon Fraternity, Detroit Athletic Club and Detroit Purdue Club.

Morris Sheffler

Morris Sheffler, Philadelphia, Pa.: Partner, Sheffler-Gross Co., Philadelphia, Pa. • • • Received engineering degree in 1914 from University of Pennsylvania. • • • Organized Sheffler-Gross Co. in 1919. • • • Lieutenant of Ordnance in England and France during World War I. • • • Member of *Engineers Club* and *Franklin Institute.* Member of Instrument Society of America, Pennsylvania Society of Professional Engineers, Vulcan Assembly of Philadelphia, and Philmont Country Club. • • • Joined the Society in 1921.

CANDIDATES FOR MEMBERSHIP

Listed here are the names of 138 men who are the candidates for membership or advancement in membership grade. Members are requested to assume their full share of responsibility of receiving these candidates into membership by advising the Executive Secretary before May 31, 1958, of any whose eligibility for membership is questioned. Unless such objection is made these candidates will be voted upon by the Council.

*Note: *Advancement †Reinstatement*

California (*Region* 4)

ANDERSON, C. R., Design Engr., Air Conditioning Co., Inc., Glendale.

IRVING, J. C., Pres., Fred S. Renauld & Co., Pico.

ORCUTT, R. L., Engr., d'Autremont-Helms & Assocs., Los Angeles.

SAMEL, M. A., Sales Engr., Master Fan Corp., Los Angeles.

WHITE, H. A., JR., University of California, Radiation Lab., Livermore.

Colorado (*Region* 3)

YOUNG, D. E., Repr., Herman & Von Rosenberg, Denver.

Delaware (*Region* 1)

GRIER, D. D., Designer Engr., E. I. duPont de Nemours & Co., Newark.

Florida (*Region* 5)

DONEY, V. A., Sales & Service Engr., Florida Power Corp., Trenton.

HELZEL, G. E., Vice Pres., The Helzel Co., Gainesville.

Georgia (*Region* 5)

AVRA, H. T., Secy.-Treas. A.G.N. Contracting Engineers, Inc., Atlanta.

QUARLES, E. W., SR., Pres., Quarles Refrigeration Co., Inc., Savannah.

Illinois (*Region* 2)

COUCH, H. J.*, Exec. Secy., Ventilating & Air Conditioning Contractors Association of Chicago, Chicago.

HEANEY, C. J.†, Engr., Visking Co., Chicago.

MARSAILES, T. P., Vtg. & A-C. Engr., R. R. Donnelley & Sons Co., Chicago.

Iowa (*Region* 3)

HILDRETH, W. T., Sales Engr., Plumb Supply Co., Des Moines.

KERNS, R. R., Factory Engr., Lennox Industries, Inc., Des Moines.

SMITH, J. S., Vice Pres., Titus Manufacturing Co., Waterloo.

Kansas (*Region* 3)

ATTRI, N. S., Research Instr., Dept. of Mechanical Engineering, Kansas State College, Manhattan.

Kentucky (*Region* 5)

KLAPHEKE, A. A., Test Engr., American Radiator & Standard Sanitary Corp., Louisville.

STEVENS, W. R.*, Pres., L. E. Stevens Co., Newport.

Louisiana (*Region* 5)

DUNN, I. S., Dist. Service Supvsr., A-C. Div., Westinghouse Elect. Corp., New Orleans.

Massachusetts (*Region* 1)

BONAZZOLI, A. F., JR., Mgr., Htg. & Vtg. Div., Bonazzoli Coal Co., Inc., Framingham.

GORCHEV, D. T., Cons. Engr., Buerkel & Co., Boston.

GREENLEAF, S. J., Partner, Greenleaf & Wong, Cambridge.

MATHER, C. T.*, Engr., Lincoln M. Dunlap, Cons. Engr., Fall River.

Michigan (*Region* 2)

DWYER, P. R., Supvsr. of Steam Sales, Detroit Edison, Detroit.

LEADBITTER, L. I., Mech. Engr., Smith, Tarapata & MacMahon, Birmingham.

LOUIS, W. C., Mech. Job Engr., Smith, Hinchman & Grylls Assocs., Inc., Detroit.

Minnesota (*Region* 3)

DROM, A. D., Asst. Mgr., Midwest Sheet Metal Works, Minneapolis.

ELDORADO, J. H., Estimator, Midwest Sheet Metal Works, Minneapolis.

ELNICKY, M. J., Owner & Mgr., Midwest Sheet Metal Works, Minneapolis.

HAUGEN, H. P., Sales Repr., Asbestos Products, Inc., St. Paul.

PRIEVE, H. L., Sales Engr., McQuay, Inc., Minneapolis.

Missouri (*Region* 3)

ALLEN, P. B., Sales Engr., Johnson Service Co., Kansas City.

BELL, J. E. JR., Sr. Engr., Remington Arms Co., Inc., Independence.

BERRON, M. G., Asst. Sales Mgr., Airtherm Manufacturing Co., St. Louis.

BRUNNER, W. A., Engr., Seaman & Schuske Metal Works Co., St. Joseph.

CHEYNEY, C. H., Vice Pres., The C. H. Burnap Co., Inc., St. Louis.

FOSTER, J. W., Engr., M. F. Carlock & Co., Sikeston.

HOPKINS, E. M.*, Sales Engr., Minneapolis-Honeywell Regulator Co., Kansas City.

LUCAS, E. B.*, Design Engr., Bendix Aviation Corp., Kansas City.

MOSS, G. W., Thermal Rating Engr., Degree Corp., Kansas City.

VOGT, R. A., Partner, B & V Sales Co., St. Louis.

WILLIAMS, B. L., Sr. Engr., Remington Arms Co., Inc., Independence.

New Jersey (*Region* 1)

ARMSTRONG, S. J., Appl. Engr., General Electric Co., A-C. Div., Bloomfield.

CHINITZ, MILTON, Sales Repr., Heat Transfer Sales Co.-Representing Fedders-Quigan Corp., Saddle Brook.

GAFFNEY, L. F.†, Sr. Plt. Design Engr., Reaction Motors, Inc., Danville.

Iliff, C. C., Jr., Exec. Vice Pres., The Hart & Iliff Fuel Co., Newton.

Klein, W. P.†, Sales Engr., Federal Boiler Co., Midland Park.

Tepe, L. C., Sales Engr., John J. Nesbitt, Inc., E. Orange.

New Mexico (*Region* 6)

Thompson, E. R., Chief Plbg. Designer, Bridgers & Paxton, Albuquerque.

New York (*Region* 1)

Batherman, R. E., Prop., Vico Co., Representing Vibration Mountings, Inc., Corona.

Calderone, P. A., Repr., Crane Co., Long Island City.

Cohan, H. A. Jr.*, Sales Engr., Kerby Saunders, Inc., New York.

Evenchick, William, Sales Mgr., Wholesale Distributors, Inc., Jamaica.

Grygo, R. F., Engr., Berwind & Co., Inc., Garden City So.

Hack, Fred, Br. Sales Mgr., John J. Nesbitt, Inc., Syracuse.

Maurer, Warren, Design Engr., Voorhees Walker Smith & Smith, New York.

Melato, R. J., Estimator & Supt., Berwind & Co., Inc., Garden City So.

Olvany, W. J.*, Pres., William J. Olvany, Inc., New York.

Roberts, D. K.*, Sales Engr., Thermodyne Corp. & Kerby Saunders, Inc., New York.

North Carolina (*Region* 5)

Atkinson, C. W., Repr., The Powers Regulator Co., Greensboro.

Harden, M. R., Jr., Assoc., T. C. Cooke, Cons. Engr., Durham.

Ohio (*Region* 2)

Albert, R. A., Jr.*, Chief Engr., Sheet Metal Engineering Co., Cincinnati.

Anderson, R. G.*, Partner, F. W. Jenike Co., Cincinnati.

Clarkson, J. P., Com. Repr., Ohio Fuel Oil Co., Toledo.

Combs, L. H., Dist. Sales Mgr., Ebco Mfg. Co., Columbus.

Kahler, H. A.*, Designer, Bosch & LaTour, Cincinnati.

Keener, R. L.*, Pres., Keen-Air Conditioning Corp., Columbus.

Kennedy, J. C., Dist. Sales Mgr., Ebco Mfg. Co., Columbus.

Krantz, C. P.*, Dist. Mgr., The Powers Regulator Co., Cincinnati.

Lienhart, F. B.*, Owner, Lienhart Air Conditioning Co., Cincinnati.

Lynam, J. T.*, Sales Engr., Powers Regulator Co., Cleveland.

Matheis, R. A.*, Dist. Mgr., The Trane Co., Cincinnati.

McAndrews, R. F.*, Owner, R. F. McAndrews Co., Cincinnati.

Stilson, J. H., Mech. Engr., A. E. Stilson & Assoc., Columbus.

Varble, Pinkey*, Asst. Mgr. Cincinnati Office, American Raditator & Standard Sanitary Corp., Cincinnati.

Wagner, C. H.*, Secy.-Treas., Sheet Metal Engineering Co., Cincinnati.

Attention!!
Members of ASHAE
Moved or Moving?

Each month mail is returned BECAUSE you overlooked advising us of the change in your address.

In your own interest, will you please advise us at once of any change in your business or home address, indicating which is your mailing address.

ASHAE Headquarters
62 Worth St.
New York 13, N. Y.

Weber, O. J.*, Co-Owner, Weber-Rishel Co., Cincinnati.

Wilson, J. F., Sales Engr., Robert A. Wilson & Co., Columbus.

Oklahoma (*Region* 6)

Briggs, L. O.*, Supervising Design Engr., Phillips Petroleum Co., Bartlesville.

Keif, R. G.*, Sales Engr., O'Connor-Oklahoma Co., Inc., Oklahoma City.

Oregon (*Region* 4)

Larsen, F. L., Repr., Norman S. Wright & Co., Portland.

Peterson, H. I., Sales Repr., Larry Harrington Co., Inc., Portland.

Piland, A. J., Repr., E. S. Constant Co., Portland.

Pennsylvania (*Region* 1)

Colling, R. E., Prod. Engr., National-U.S. Radiator Corp., Johnstown.

Gruggel, C. A., Jr., A-C. Advisor, The Manufacturers Light and Heat Co., Pittsburgh.

Pridmore, C. F., Architectural Dvlpt. Engr., Aluminum Company of America, New Kensington.

Schrier, J. T., Sales Engr., Minneapolis-Honeywell Regulator Co., Philadelphia.

Zellner, F. J., Sales Engr., Minneapolis-Honeywell Regulator Co., Philadelphia.

Rhode Island (*Region* 1)

Greene, H. C., Mgr., Braley & McLaughlin, Providence.

McLaughlin, J. D.†, Owner, Braley & McLaughlin, Providence.

South Carolina (*Region* 5)

Spangler, G. P., Sales Engr., Minneapolis-Honeywell Regulator Co., Columbia.

Tennessee (*Region* 5)

Slusher, R. L.*, Engr., Union Carbide Nuclear Co., Oak Ridge.

Texas (*Region* 6)

Blumenthal, E. A., Chief Engr., Atlas Air Conditioning Co., Houston.

Cabaniss, J. R., Sales Engr., Atlas Air Conditioning Co., Houston.

Honeycutt, J. L., Jr., Sales Engr., Atlas Air Conditioning Co., Houston.

Mattox, J. K. Jr.*, Engr., Texas Refrigeration Supply Co., Fort Worth.

Powell, J. H.†, Dist. Mgr., Eggelhof Engineers, Inc., San Antonio.

Rothrock, R. O.†, Sales Engr., Atlas Air Conditioning Co., Houston.

Seals, F. C., Jr., Mech. Engr., General Services Admn., Design & Construction Div., Dallas.

Warren, T. A., Mgr. Austin Area, Natkin & Co., Austin.

Williams, L. C., Mgr. A-C. Div., Twin Star Industries, Inc., Austin.

Utah (*Region* 4)

Eichers, J. N.†, Sales Appl. Engr., Stevens Sales Co., Salt Lake City.

Jensen, D. L., Sales Engr., Johnson Service Co., Salt Lake City.

Washington (*Region* 4)

Barker, E. H., Partner, Aabco Heating Co., Seattle.

Shoen, G. W., Asst. Sales Mgr., Consolidated Supply Co., Spokane.

Smith, H. D.*, Design Engr., H. E. Bovay. Jr., Cons. Engr., Spokane.

Wisconsin (*Region* 2)

Heyman, R. L., Design Engr., Lofte & Fredericksen, Milwaukee.

Mason, J. H., Asst. to Gen. Sales Mgr., Johnson Service Co. Milwaukee.

Ratai, W. R., Engr., Lofte and Fredericksen, Milwaukee.

Canada (*Region* 7)

Barham, B. O., Office Mgr., Cumming Galbraith Ltd., Edmonton, Alta.

Bate, R. C., Design Engr., Adjeleian, Goodkey, Weedmark & Assocs., Ltd., Ottawa, Ont.

Black, D. K. J., A-C. Engr., Arnett Co. Ltd., Winnipeg, Man.

Briggs, R. J., Mech. Engr., Stock Ramsay & Assocs., Regina, Sask.

Findlay, H. W., Dist. Depr., B. F. Sturtevant Co., Ottawa, Ont.

Grevemeyer, E. M.*, Vtg. Engr., Falconbridge Nickel Mines Ltd., Falconbridge, Ont.

Hill, G. L., Indus. Prod. Sales Supvsr., Fiberglas Canada Ltd., Toronto, Ont.

Hole, J. H., Mgr., Lockerbie & Hole Western, Ltd., Calgary, Alta.

Jaycock, S. D., Sales Engr., American Standard Products (Canada), Ltd., Ottawa, Ont.

Mara, W. K., Mgr., Thomas Mara & Son, Brampton, Ont.

Piercy, R. F., Sales Engr., Barber-Colman of Canada, Ltd., Toronto, Ont.

Potts, R. E. E.*, Indus. & Com. Repr., Consumers Gas Co., Toronto, Ont.

Rogers, Clifford, Tech. Officer 3, Dept. of Public Works of Canada, Ottawa, Ont.

Marshall, H. G., Br. Mgr., Ross Engineering of Canada, Ltd., Port Arthur, Ont.

Sigsworth, B. O., Br. Mgr., Dunham-Bush (Canada) Ltd., Calgary, Alta.

Skibin, Arthur, Sales Engr., Atlas Webster Industries, Ltd., Montreal, Que.

Egypt

Romano, Chaya, Chief Engr., Tech. Office, A-C. Dept., Tractor & Engineering Co. SAE., Cairo.

France

Ladent, Claude, Sales Engr., Etablissements Neu., Lille (Nord).

Italy

Bertolini, G. F., Cons. Engr., Milan.

Bilotta, Giuseppe, Sales Engr., Jucker S.P.A., Milan.

Jovane, Luciano, Asst. Tech. Mgr., Ideal Standard, S.P.A., Milan.

Netherlands

Hamelynck, Arnold, Design Engr., Dullink, Ltd., The Hague.

Han, T. W., Design Engr., Dullink, Ltd., The Hague.

South Africa

Harding, K. W., Design Sales Engr., W. G. Davey (Pty), Ltd., Johannesburg.

Thailand

Vanasup, Noonsong, Engr., Bangkok Electric Works, Bangkok.

OBITUARY

CHARLES H. KOPER

Cincinnati, Ohio

Charles H. Koper, engineer for Sullivan-Isaacs-Sullivan, Inc., Cincinnati, Ohio, died recently. Mr. Koper was a member of the Cincinnati Chapter.

Mr. Koper was born in Cincinnati and was graduated from the International Correspondence School in 1914. After graduation he worked for various engineering firms including the Cincinnati Plumbing & Heating Co.; the Wickham Construction Co., Cincinnati; Hoffman Specialty Co., Chicago, Ill.; Graves & Marshall, Inc., Cleveland; B. F. Sturtevant Co., Cleveland; Grunkemeyer & Sullivan & Assoc., Cincinnati; and later with Sullivan-Isaacs-Sullivan, Inc.

Regional Organization of Society Chapters

Regions Central Comm. W. A. Grant, Chairman	Regional Areas	Chapters Regional Committees		
		Chapter	Member	Alternate
No. 1 **F. H. Faust** **Chairman**	Conn.	Connecticut (New Haven)	Walter Heywood, Jr.	J. D. Pierce
	Del., Maine			
	Mass.	Massachusetts (Boston)	E. L. Blair	R. F. Curry
	Mass.	Western Massachusetts (Springfield)	F. A. Ferraro	C. R. Munn
	N. H.			
	N. J.	North Jersey (Newark)	S. H. Nitzberg	L. G. Huggins
	N. Y.	Central New York (Syracuse)	L. A. Childs	S. F. Gilman
	N. Y.	Empire State Capital (Albany)	H. F. Kruger	R. B. Taylor
	N. Y.	Long Island	H. J. Campbell, Jr.	C. M. Alston
	N. Y.	New York	J. B. Hewett	C. R. Hiers
	N. Y.	Western New York (Buffalo)	C. W. Stone	J. P. Guerra
	Pa.	Philadelphia	E. K. Wagner	C. J. Forve
	Pa.	Pittsburgh	E. H. Riesmeyer, Jr.	E. J. Busch
	Pa.	Johnstown	K. O. Schlentner	J. K. Thornton
	R. I., Vt.			
No. 2 **P. J. Marschall** **Chairman**	Ill.	Illinois (Chicago)	H. E. Anderson	Herbert Kreisman
	Ind.	Indiana (Indianapolis)	A. O. Roche, Jr.	G. W. Vogel
	Mich.	Michigan (Detroit)	D. S. Falk	K. J. Wagoner
	Mich.	Western Michigan (Grand Rapids)	B. J. Walter	R. J. Waalkes
	Ohio	Central Ohio (Columbus)	W. A. Schoonover	T. R. Walker
	Ohio	Cincinnati	T. D. Reiley	C. P. Krantz
	Ohio	Miami Valley (Dayton)	L. P. Brehm	R. B. Walcott
	Ohio	Northern Ohio (Cleveland)	J. L. Frissee	R. A. Urban
	Ohio	Toledo	J. F. Guest	Robert Greenwald
	Wis.	Wisconsin (Milwaukee)	R. D. Rodwell	A. A. Stutheit
No. 3 **Fred Janssen** **Chairman**	Colo.	Rocky Mountain (Denver)	A. S. Widdowfield	D. D. Pearsall
	Iowa	Iowa (Des Moines)	R. S. Stover	R. T. Howard, Jr.
	Iowa	Illinois - Iowa (Moline, Ill.)	W. W. Dodge	D. H. Ninow
	Kan.	Kansas (Wichita)	T. L. Roberts	R. F. Jamison
	Minn.	Minnesota (Minneapolis)	F. G. Vogt	J. H. Jester
	Mo.	Kansas City	J. C. Fasnacht	L. A. Heaven
	Mo.	St. Louis	J. J. Blackmore	N. J. Hubbuch
	Mont.			
	Neb.	Nebraska (Omaha)	E. N. Seiler	F. P. Manchester, Jr.
	N. D., S. D., Wyo.			
No. 4 **W. O. Stewart** **Chairman**	Ariz.	Arizona (Phoenix)	E. P. Boothroyd	F. W. Gabbard
	Calif.	Golden Gate (San Francisco)	Herb Duncan	J. I. Sprott
	Calif.	Sacramento Valley (Sacramento)	M. J. Delavan	J. A. White
	Calif.	Southern California (Los Angeles)	W. J. Biggar	A. Z. Levine
	Idaho, Nevada			
	Ore.	Oregon (Portland)	Keith Kruchbeck	W. B. Hayes
	Utah	Utah (Salt Lake City)	L. K. Irvine	C. E. Ferguson
	Wash.	Puget Sound (Seattle)	M. W. McKinstry	H. M. Hendrickson
	Wash.	Inland Empire (Spokane)	R. D. Nevers	J. A. Doyle
No. 5 **J. W. May** **Chairman**	Ala.			
	Fla.	Jacksonville	W. H. Dowling, Jr.	H. A. Holborn
	Ga.	Atlanta	J. S. Edgar	W. P. West
	Ga.	Savannah	R. L. Reilley	S. H. Ball
	Ky.	Bluegrass (Louisville)	O. J. Hill	H. L. Carr
	La.	Delta (New Orleans)	J. H. Maloney	W. B. Moses
	La.	Baton Rouge	A. W. Holland	W. J. Le Blanc
	Md.	Baltimore	R. E. Dressell	F. M. Hewitt
	Miss.	Mississippi (Jackson)	L. H. Smith	R. E. Vernon
	N. C.	Northern Piedmont (Greensboro)	J. E. Hart	G. B. Rottman
	N. C.	Southern Piedmont (Charlotte)	W. P. Wells	J. R. Clark
	S. C.	South Carolina (Columbia)	B. A. Leppard	H. J. Haar, Jr.
	Tenn.	Memphis	G. B. Ramsey, Jr.	J. G. Coleman
	Va.	Virginia (Norfolk)	D. L. Gusler	J. A. Hoffman
	D. C.	Washington, D. C.	H. W. Rush	J. W. Morgan
	W. Va.			
No. 6 **P. N. Vinther** **Chairman**	Ark.	Arkansas (Little Rock)	J. W. Thompson	W. A. Bullard
	La.	Shreveport	J. S. Malahy, Jr.	F. H. Spaulding, Jr.
	N. Mex.	New Mexico (Albuquerque)	F. H. Bridgers	E. T. Krytko
	Okla.	Northeastern Oklahoma (Tulsa)	J. E. Tumilty	G. A. McCune
	Okla.	Oklahoma (Oklahoma City)	F. R. Denham	W. R. Johnson
	Texas	Austin	J. L. Rea, Jr.	W. H. Luedecke
	Texas	El Paso	G. H. Jackson	F. A. Huchet, Jr.
	Texas	North Texas (Dallas)	G. H. Meffert	O. H. Mehl
	Texas	South Texas (Houston)	H. D. McMillan	E. B. Appling
	Texas	Southwest Texas (San Antonio)	F. S. Dalton	D. T. Kern
	Texas	West Texas (Lubbock)	L. F. Davidson	R. A. Mixon
	Texas	Fort Worth	T. B. Romine, Jr.	J. K. Mattox, Jr.
No. 7 **W. G. Hole** **Chairman**	B. C.	British Columbia (Vancouver)	S. W. Welsh	A. C. Martin
	Man.	Manitoba (Winnipeg)	H. F. Randall	A. K. Piercy
	Que.	Montreal	D. J. McIntyre	Arthur de Breyne
	Que.	Châpitre de la Ville de Québec	Jean Veilleux	P. J. Lamarche
	Ont.	Ontario (Toronto)	John Thompson	R. A. Ritchie
	Ont.	Ottawa Valley (Ottawa)	Jacob Klassen	A. H. Hargreaves
	Alta.	Northern Alberta (Edmonton)	R. G. Proudfoot	G. N. Campbell
		Southern Alberta (Calgary)	H. W. Klassen	L. D. Ontonio

Society Organization Personnel

Council and Council Committees, Advisory Board, General and Special Committees: The latest list of the Council and Council Committees, Advisory Board, and General Committees appears in the February 1958 JOURNAL SECTION on page 146

Nominating Committee: This committee's membership is fixed by the By-Laws. The latest listing appears in the February 1958 JOURNAL SECTION on page 146

Society Regional Organization: The 1958 listing of the names of the Regional Directors and of the members of the Chapters Regional Committees appears in this issue (see above)

Research Committees: The research program is under the guidance of the Committee on Research — a General Committee. The Committee on Research appoints Technical Advisory Committees as needed. The 1958 personnel is scheduled to appear in the June 1958 JOURNAL SECTION. The 1957 listing appears in the December 1957 issue on page 160

Society Chapters and Branches: The Society has chartered 72 Chapters, 1 Overseas Branch, and 6 Student Branches. These groups elect their officers and governing boards. A list of the presidents and secretaries appears in this issue (see pp. 195-196)

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS

Headquarters Office
62 Worth St., New York 13, N.Y.
Tel: BArclay 7-6262

(For names of Society Officers see p. 158)

Research Laboratory
7218 Euclid Ave., Cleveland 3, Ohio
Tel: UTah 1-6161

Presidents and Secretaries of Society Chapters and Branches

The Society has chartered 72 Chapters, 1 Overseas Branch, and 6 Student Branches. These organizations elect their own officers and governing boards. Following is a list giving the name and address of the president and secretary of each of these groups.

Date indicates year organized; and address and no city shown signifies same city as headquarters; numeral in parentheses indicates zone.

ARIZONA

Arizona: 1953. Hdqrs., Phoenix. Meets, 1st Mon. PRES, E. P. Boothroyd, 1341 W. Catalina Dr. SECY, G. L. Jackson, Jr., 932 E. San Miguel.

ARKANSAS

Arkansas: 1952. Hdqrs., Little Rock. Meets, 3rd Tues. PRES, H. H. Himstedt, 510 E. 3rd St. SECY, Allen Bullard, 509 E. Markham St.

CALIFORNIA

Golden Gate: 1937. Hdqrs., San Francisco. Meets, 1st Thurs. PRES, Herb Duncan, 938 N. Linden Ave., South San Francisco. SECY, T. R. Simonson, 507 Howard St. (5).

Sacramento Valley: 1952. Hdqrs., Sacramento. Meets. 1st Wed. PRES, M. J. Delavan, 405 Meister Way (19). SECY, R. T. Andrews, 4305 Laurelwood Way (21).

Southern California: 1930. Hdqrs., Los Angeles. Meets, 1st Tues. PRES, W. J. Biggar 6620 Telegraph Rd. (22). SECY, R. C. Taylor, 1270 Tropical Ave., Pasadena (8).

COLORADO

Rocky Mountain: 1944. Hdqrs., Denver. Meets, 1st Wed. PRES, D. D. Pearsall, 120 W. 5th Ave. SECY, J. F. Perkis, 3453 S. Forest St. (22).

CONNECTICUT

Connecticut: 1940. Hdqrs., New Haven. Meets, 3rd Thurs. PRES, Fritz Honerkamp, 36 E. Maxwell Dr., West Hartford (7). SECY, F. J. Raible, Jr., 1007 Farmington Ave., West Hartford (7).

DISTRICT OF COLUMBIA

Washington, D.C.: 1935. Hdqrs. Washington, D.C. Meets, 2nd Wed. PRES, H. W. Rush, 116 Southwood Ave., Silver Spring, Md. SECY, L. D. Pain, 102-B Ames Rd., Silver Spring, Md.

FLORIDA

Jacksonville: 1957. Hdqrs., Jacksonville. Meets, 1st Tues. PRES, B. J. Saymon, P.O Box 4817 (1). SECY, G. A. Israel, Jr., 115 Park St., P.O. Box 2527 (3).

GEORGIA

Mon. PRES, J. A. Marshall, 1415 Howell Mill
Atlanta: 1937. Hdqrs., Atlanta. Meets, 2nd
Rd. SECY, W. P. West, 409 Bishop St., N.W. (13).

Savannah: 1958. Hdqrs., Savannah. PRES, R. L. Reiley, 113 Harlan Dr. SECY, R. E. Kinser, Box 3368, Station A.

ILLINOIS

Illinois: 1906. Hdqrs., Chicago. Meets, 2nd Mon. PRES, H. E. Anderson, 530-544 Hyde Park Ave., Hillside. SECY, J. C. Scott, 6655 N. Ridge Blvd. (26).

Illinois-Iowa: 1956. Hdqrs., Moline. Meets, 3rd Mon. PRES, W. W. Dodge, 3125 N. Sheridan Rd., Peoria. SECY, E. O. Hull, 1009 Ridge Rd., Peoria.

INDIANA

Indiana: 1943. Hdqrs., Indianapolis. Meets, 4th Tues. PRES, G. W. Vogel, 31 E. Georgia St. (4). SECY, J. M. Teskoski, 111 E. 34th St.

IOWA

Iowa: 1940. Hdqrs., Des Moines. Meets, 2nd Tues. PRES, W. A. Schworm, Physical Plant Dept., Iowa State College, Ames. SECY, C. B. Campbell, 3121 Dean Ave.

KANSAS

Kansas: 1951. Hdqrs., Wichita. Meets, Tues. after 1st Mon. PRES, T. L. Roberts, 2008 S. Parkwood (18). SECY, G. L. Oswald, 1117 E. Waterman.

KENTUCKY

Bluegrass: 1954. Hdqrs., Louisville. Meets, 2nd Mon. PRES, O. J. Hill, 319 W. Jefferson St., Rm. 316 (2). SECY, H. L. Carr, 2725 Shannon Dr. (5).

LOUISIANA

Baton Rouge: 1955. Hdqrs., Baton Rouge. Meets, 3rd Wed. PRES, A. W. Holland, 3958 Convention St. SECY, J. P. Jones, Box 358.

Delta: 1939. Hdqrs., New Orleans. Meets, 3rd Tues. PRES, L. R. Maxwell, 3038 Earhart Blvd. (25). SECY, J. H. Maloney, 501 N. Jefferson Davis Pkwy. (19).

Shreveport: 1948. Hdqrs., Shreveport. Meets, 3rd Thurs. PRES, A. J. Jones, Jr., 753 Gladstone. SECY, J. L. Collins, Jr., 640 Delaware St.

MARYLAND

Baltimore: 1949. Hdqrs., Baltimore. Meets, 3rd Wed. PRES, R. E. Dressell, c/o F. M. Hewitt, 33 E. 21st St. (18). SECY, J. H. Baker, 2 E. 22nd St. (18).

MASSACHUSETTS

Massachusetts: 1912. Hdqrs., Boston. Meets, 3rd Tues. PRES, E. L. Blair, 108 Willow Ave., Wollaston (70). SECY, R. E. Reid, 313 Washington St., Newton (58).

Western Massachusetts: 1955. Hdqrs., Springfield. PRES, F. A. Ferraro, 293 Bridge St. SECY, J. J. Curran, 207 Liberty St. (4).

MICHIGAN

Michigan: 1916. Hdqrs., Detroit. Meets, 1st Mon. after 10th of month. PRES, P. S. Hosman, 16141 Harlow Ave. (35). SECY, J. B. Olivieri, 9317 Gratiot (13).

Western Michigan: 1931. Hdqrs., Grand Rapids. Meets, 2nd Mon. PRES, B. J. Walter, 333 Fuller Ave., N.E. (3). SECY, S. R. Curtis, 1810 W. Rundle, Lansing.

MINNESOTA

Minnesota: 1918. Hdqrs., Minneapolis. Meets, 1st Mon. PRES, Fred Vogt, 6530 W. Lake St. (26). SECY, J. W. McNamara, 850 Cromwell Ave., St. Paul (14).

MISSISSIPPI

Mississippi: 1953. Hdqrs., Jackson. Meets, 4th Mon. PRES, T. D. Luke, P.O. Box 1134 413 S. President. SECY, M. E. Arledge, P.O. Box 2324.

MISSOURI

Kansas City: 1917. Hdqrs., Kansas City. Meets, 1st Mon. PRES, S. C. McCann, 210 W. 10th St. (5). SECY, L. A. Heaven, 1529 Wyandotte (8).

St. Louis: 1918. Hdqrs., St. Louis. Meets, 2nd Tues. PRES, N. J. Hubbuch, 7020 Cornell, University City (5). SECY, K. O. Williams, 3200 Oliver Ave., East St. Louis.

NEBRASKA

Nebraska: 1940. Hdqrs., Omaha. Meets, 2nd Tues. PRES, M. F. Stober, 633 Insurance Bldg. SECY, F. P. Manchester, Jr., 1141 S. 19th (3).

JOURNAL SECTION

NEW JERSEY

North Jersey: 1952. Hdqrs., Newark. Meets, 2nd Tues. PRES, Martin Christesen, 21 Valley Brook Dr., Emerson. SECY, L. G. Huggins, 69 Woodland Ave., Glen Ridge.

NEW MEXICO

New Mexico: 1954. Hdqrs., Albuquerque. Meets, 3rd Tues. PRES, J. K. James, 4462 Avenida del Sol, N.E. SECY, R. P. Lee, 114 Granite Ave., N.W.

NEW YORK

Central New York: 1944. Hdqrs., Syracuse. Meets, 4th Wed. PRES, Merle Weninger, 230 Goodrich Ave. SECY, S. F. Gilman, 300 S. Geddes St. (1).

Empire State Capital: 1951. Hdqrs., Albany. Meets, 2nd Wed. PRES, H. F. Kruger, 501 Seventh Ave., Troy. SECY, B. E. Mullen, Maplewood & Kraft Aves.

Long Island: 1957. Hdqrs., Garden City. Meets, 2nd Mon. PRES, H. J. Campbell, Jr., 288 Old Country Rd., Mineola. SECY, J. L. Page, 41 W. 22nd St., Huntington Station.

New York: 1911. Hdqrs., New York. Meets, 3rd Mon. PRES, C. R. Hiers, 19 Westminster Rd., Great Neck. SECY, L. D. Carr, 534 West Broadway.

Western New York: 1919. Hdqrs., Buffalo. Meets, 2nd Mon. PRES, G. E. Kuhn, 475 Woodland Dr., Kenmore (23). SECY, D. J. Seifert, 220 Delaware Ave. (2).

NORTH CAROLINA

Northern Piedmont: 1952. Hdqrs., Greensboro. Meets, 2nd or 3rd. Fri. PRES, G. B. Rottman, 233½ N. Greene. SECY, E. A. Stroupe, Jr., P.O. Box 3135.

Southern Piedmont: 1952. Hdqrs., Charlotte. Meets, last Mon. PRES, G. C. Garrett, P.O. Box 3697 (3). SECY, N. W. McGuire, 1314 E. Fourth St.

OHIO

Central Ohio: 1944. Hdqrs., Columbus. Meets, 3rd Mon. PRES, T. R. Walker, 182 N. Yale Ave. SECY, J. W. Ford, 2—15th Ave.

Cincinnati: 1932. Hdqrs., Cincinnati. Meets, 1st Tues. PRES, T. D. Reilley, 1905 Dunlap St. (14). SECY, E. A. Sobolewski, 3207 Hardisty Ave. (8).

Miami Valley: 1950. Hdqrs., Dayton. Meets, 1st Wed. PRES, L. P. Brehm, 315 S. Bromfield Rd. (9). SECY, N. O. Mitchell, 1441 Milburn.

Northern Ohio: 1916. Hdqrs., Cleveland. Meets, 2nd Mon. PRES, R. E. Leising, 3250 Dellwood Rd., Cleveland Heights (18). SECY, J. F. Koran, 4318 Bucyrus Ave. (9).

Toledo: 1954. Hdqrs., Toledo. Meets, 1st Mon. PRES, Robert Greenwald, 2525 Portsmouth Ave. (13). SECY, G. R. Munger, 1254 Shelly Ave., Maumee.

OKLAHOMA

Northeastern Oklahoma: 1948. Hdqrs., Tulsa. Meets, 2nd Tues. PRES, C. H. Dollmeyer, 4972 E. 26th St. SECY, R. H. Combs, P.O. Box 871 (2).

Oklahoma: 1935. Hdqrs., Oklahoma City. Meets, 2nd Mon. PRES, A. C. Shelley, 2946 Nimitz (12). SECY, W. H. Stewart (Mail to: W. R. Johnson, 120 E. Main).

OREGON

Oregon: 1939. Hdqrs., Portland. Meets, Thurs. after 1st Tues. PRES, W. B. Hayes, 6446 N.E. 24 (11). SECY, W. S. Cooper, 445 Pittock Block.

PENNSYLVANIA

Johnstown: 1957. Hdqrs., Johnstown. PRES, W. L. Ross, 2051 Franklin St. SECY, J. K. Thornton, R.D. 4, Box 230.

Philadelphia: 1916. Hdqrs., Philadelphia, Meets, 2nd Thurs. PRES, P. H. Yeomans, 10 S. 18th St. (3). SECY, D. S. Plewes, 2853 N. 12th St. (33).

Pittsburgh: 1919. Hdqrs., Pittsburgh. Meets, 3rd Mon. PRES, E. H. Riesmeyer, Jr., 231-33 Ft. Pitt Blvd. (22). SECY, G. E. Smetak, 2793 Nobestown Rd. (5).

SOUTH CAROLINA

South Carolina: 1954. Hdqrs., Columbia. Meets, 3rd Mon. PRES, B. A. Leppard, P.O. Box 3128-A, Greenville. SECY, H. J. Haar, Jr., Garner Rd., Rte. 6, Spartanburg.

TENNESSEE

Memphis: 1944. Hdqrs., Memphis. Meets, 3rd Mon. PRES, R. H. Bolding, 107 East E. H. Crump Blvd. SECY, H. W. Wade, 4711 Poplar (17).

TEXAS

Austin: 1956. Hdqrs., Austin. Meets, 3rd Thurs. PRES, A. C. Lagow, 4506 Oakmont Blvd. SECY, Prof. J. R. Watt, M. E. Dept., University of Texas (12).

El Paso: 1956. Hdqrs., El Paso. Meets, 3rd Mon. PRES, W. A. Byars, Jr., 937 N. Clark Rd. SECY, J. H. Brooks, 4028 Hamilton St.

Fort Worth: 1957. Hdqrs., Fort Worth. Meets, 3rd Wed. PRES, T. B. Romine, Jr., 3 Wofford Bldg., 2816 Morton. SECY, C. L. Zahn, 2509 W. Berry St. (9).

North Texas: 1938. Hdqrs., Dallas. Meets, 3rd Mon. PRES, Ross Zumwalt, 929 Mercantile Securities Bldg. (1). SECY, O. H. Mehl, 6915 Lavendale Ave. (30).

South Texas: 1938. Hdqrs., Houston. Meets, 3rd Fri. PRES, E. B. Appling, 2728 Weslayan (6). SECY, H. G. McKee, 2425 South Blvd. (6).

Southwest Texas: 1946. Hdqrs., San Antonio. Meets 3rd Tues. PRES, Prof. C. L. Herndon, San Antonio College, 1300 San Pedro Ave. (12). SECY, L. A. Ingle, Jr., 722 Hildebrand.

West Texas: 1953. Hdqrs., Lubbock. Meets, 1st Tues. PRES, H. L. Mayes, Box 151. SECY, W. R. Anthony, 902 E. 34th St.

UTAH

Utah: 1944. Hdqrs., Salt Lake City. Meets, 3rd Thurs. PRES, Fred Richeda, P.O. Box 479 (9). SECY, E. V. Gritton, 2470 S. 15th (5).

VIRGINIA

Virginia: 1946. Hdqrs., Norfolk. Meets, 3rd Wed. PRES, D. C. Delinger, 424 W. 21 St. (10). SECY, J. A. Hoffman, 9522 Wells Pkwy.

WASHINGTON

Inland Empire: 1950. Hdqrs., Spokane. Meets, 1st Mon. PRES, J. A. Doyle, W. 3018 Broad. SECY, J. R. Morris, 5812 North C St.

Puget Sound (Formerly Pacific Northwest): 1928. Hdqrs., Seattle. Meets, 2nd Tues. PRES, E. W. Triol, 407 Medical Arts Bldg. SECY, R. H. Liniger, 2615 Fifth Ave. (1).

WISCONSIN

Wisconsin: 1922. Hdqrs., Milwaukee. Meets, 3rd Mon. PRES, H. W. Alyea, 507 E. Michigan St. (2). SECY, A. A. Stutheit, 2697 S. Kinnic Kinnic Ave. (7).

CANADA

British Columbia: 1952. Hdqrs., Vancouver. Meets, 2nd Wed. PRES., A. C. Martin, 425 W. Second Ave. (10). SECY, W. F. Wiggins, 1128 Burrard St. (1).

Chapitre de la Ville de Quebec: 1956. Hdqrs., Quebec, P.Q. PRES, Jean Veilleux, 350 E. Charest Blvd. SECY, R. A. Harnois, 604 St. John St., Rm. 203.

Manitoba: 1935. Hdqrs., Winnipeg. Meets, 4th Thurs. PRES, R. M. Fraser, 1855 Sargent Ave. SECY, W. L. Algie, 789 Niagara St. (9).

Montreal: 1936. Hdqrs., Montreal. Meets, 3rd Mon. PRES, D. J. McIntyre, Lafleur Bldg., Rm. 300, 3600 Barclay Ave. SECY, Paul Thibault, 1434 St. Catherine, W. (25).

Northern Alberta: 1956. Hdqrs., Edmonton. Meets, 3rd Wed. PRES, P. M. Butler, 509 Northern Hardware Bldg. SECY, G. N. Campbell, 10124 104th St.

Ontario: 1922. Hdqrs., Toronto. Meets, 1st Mon. PRES, C. L. Torry, 117 Glengrove Ave., W. SECY, H. R. Roth, 57 Bloor St., W. (5).

Ottawa Valley: 1952. Hdqrs., Ottawa. Meets, 3rd Tues. PRES, C. W. Watson, 102 Bank St., Rm. 3. SECY, A. H. Hargreaves, Dept. of Public Works (2).

Southern Alberta: 1958. Hdqrs., Calgary. PRES, H. W. Klassen, 815 Sixth St., W. SECY, P. M. Meis, 102—58th Ave., SW.

OVERSEAS BRANCH

Switzerland: 1952. Hdqrs., Zurich. PRES, Albert Eigenmann, Seestr. 105 (2). SECY, Hans Kamm, Spitalgasse 30, Bern.

STUDENT BRANCHES

North Carolina State College: 1948. Faculty Adviser: Prof. R. B. Knight, M. E. Dept., Raleigh, N. C.

Oregon State College: 1949. Faculty Adviser: Prof. G. E. Thornburgh, M. E. Dept., Corvallis, Ore.

Purdue University: 1948. Faculty Adviser: Prof. F. B. Morse, M. E. Dept., West Lafayette, Ind.

Texas A. & M. College: 1946. Faculty Adviser: Prof. L. S. O'Bannon, M. E. Dept., College Station, Tex.

University of Detroit: 1949. Faculty Adviser: Prof. J. B. Olivieri, M. E. Dept., Detroit, Mich.

University of Toronto: 1951. Faculty Adviser: Prof. F. G. Ewens, M. E. Dept., Toronto, Ont., Canada.

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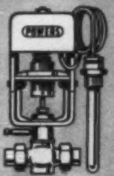

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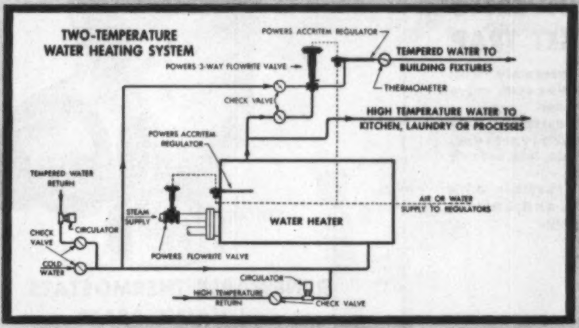
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HIGH TEMPERATURE RETURN
CHECK VALVE

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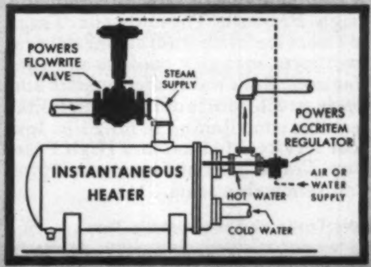
- **Small Size: Regulator head is 2⅞" wide, 3⅝" high, bulb is 12" long wtih ½" IPS Connection.**

☞ ***Write for Bulletin 316*** • **Powers SERVICE is available in 85 Cities in U.S. and Canada.**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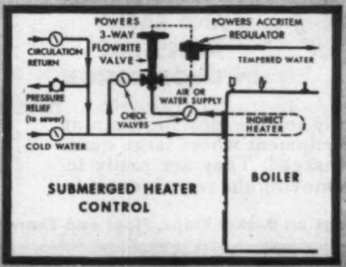
STEAM SUPPLY
POWERS ACCRITEM REGULATOR
INSTANTANEOUS HEATER
AIR OR WATER SUPPLY
HOT WATER
COLD WATER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TEMPERED WATER
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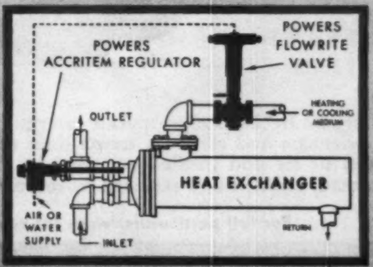
AIR OR WATER SUPPLY
CHECK VALVES
INDIRECT HEATER
COLD WATER
SUBMERGED HEATER CONTROL
BOILER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HEAT EXCHANGER
AIR OR WATER SUPPLY
INLET
RETURN

THE POWERS REGULATOR COMPANY | Skokie, Ill. • Offices in Chief Cities in U.S.A.
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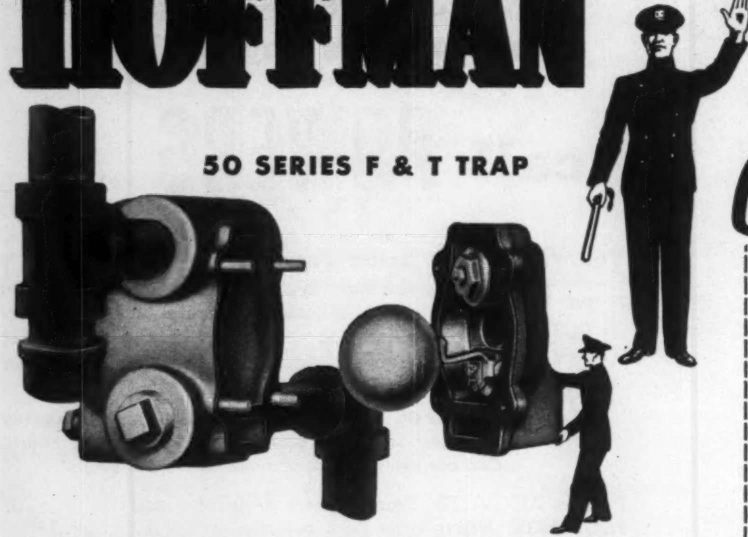
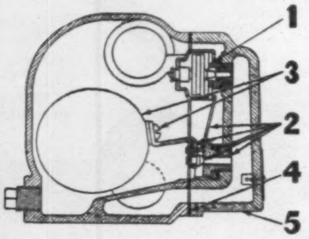
HOFFMAN TRAPS

GUARD AGAINST STEAM WASTE



50 SERIES F & T TRAP

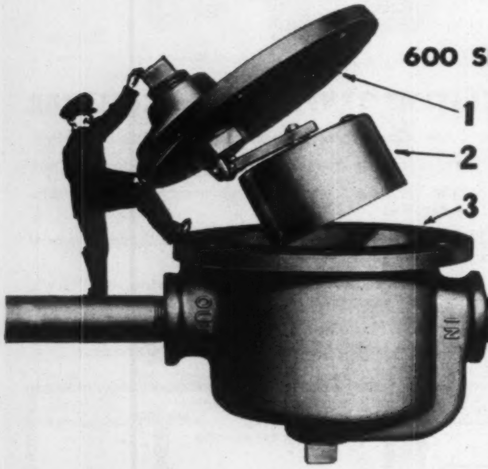
Featuring LOW MAINTENANCE COST



Float and Thermostatic Traps are so designed that all working parts of the trap are a part of the removable cover. Once installed there is no necessity for the breaking of any pipe connection for cleaning and repairing.

1. **Compact Thermostat Assembly**
2. **Durable, accurately machined Valve Lever and Seat Assembly**
3. **Copper Float Ball Assembly**
4. **Graphite Impregnated Asbestos Gasket**
5. **Heavy Duty Cast Iron Cover**

600 SERIES INVERTED BUCKET TRAP



1. **Cover assembly with plug, valve seat, valve seat holder.**
2. **Bucket assembly with lever, valve stem, bucket pin, lock nut and bucket.**
3. **Body assembly with gasket and bottom drain plug.**

HIGHLY EFFICIENT AND EASILY ACCESSIBLE INTERIOR DESIGN

Hoffman Bucket Traps operate intermittently and are ideal for draining condensate and air from steam lines or equipment where large quantities of air and condensate must be discharged. They are easily inspected, cleaned and serviced by merely removing the cover assembly.

Hoffman Traps provide improved design to *function more effectively and economically in removing condensate* from steam lines and equipment.

Hoffman engineers have anticipated steam requirements that demand less maintenance time and operating costs. Typical of Hoffman's complete line are the Traps illustrated, each with removable cover, pin and seat for quick inspection and cleaning.

LOW, MEDIUM & HIGH PRESSURE THERMOSTATIC TRAPS

RENEWABLE THERMOSTATS and VALVE SEATS

A complete line of Low, Medium and High Pressure Thermostatic Traps for service with radiation, dryers, sterilizers, mangles, cookers and similar uses. Renewable thermostats and seats are important constructional features contributing to long life, low cost service. Medium and High Pressure Traps have stainless steel pins and renewable seats.

For full particulars, write for catalogs on Bucket Traps, Float and Thermostatic Traps or Thermostatic Traps

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An Expanded Range Of
*AIR DISTRIBUTION EQUIPMENT
by
GENERAL AIR PRODUCTS CORP.

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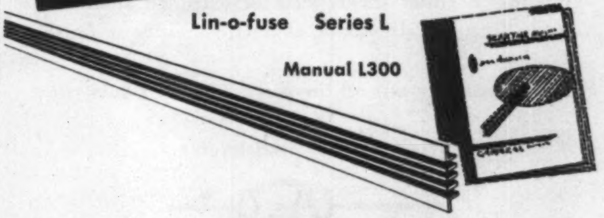
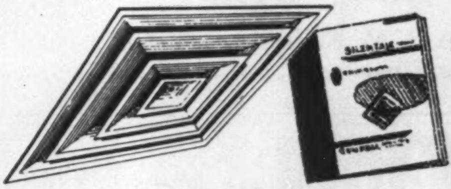


Lin-o-fuse Series L

Manual L300


SILENTAIR
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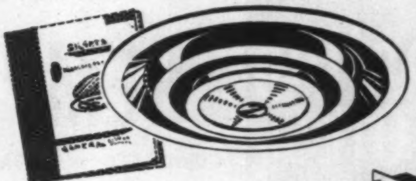
Series S
Square
Rectangular
Continuous
Manual S-400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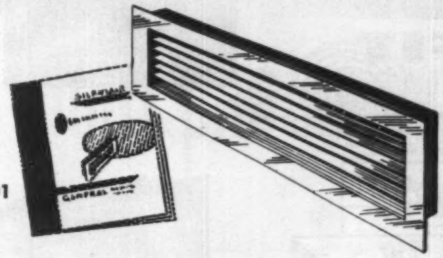
Circular Series C

Application Manual C-100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A unified treatment of modern air distribution for new and existing buildings . . . from inception of building to final installation of system . . . a guide in the selection of the air diffuser type, best suited to your needs.

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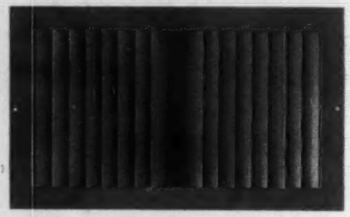
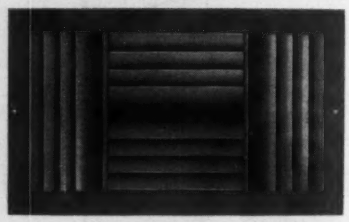
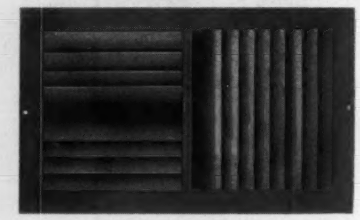


A-J 200 AIF



A-J 200 CF



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with 18 different deflection patterns!

Have a special air distribution problem? Solve it quickly, easily, economically with an A-J No. 200 Series Ceiling Diffuser.

Extruded aluminum curved blades provide maximum air control with minimum resistance. Face bars are 1¼" wide on ¾" centers. You can have your choice of multiple valves (#230) or opposed blade dampers (#240). Available in either sturdy steel or extruded aluminum frames. Chrome aluminum enamel is standard finish.

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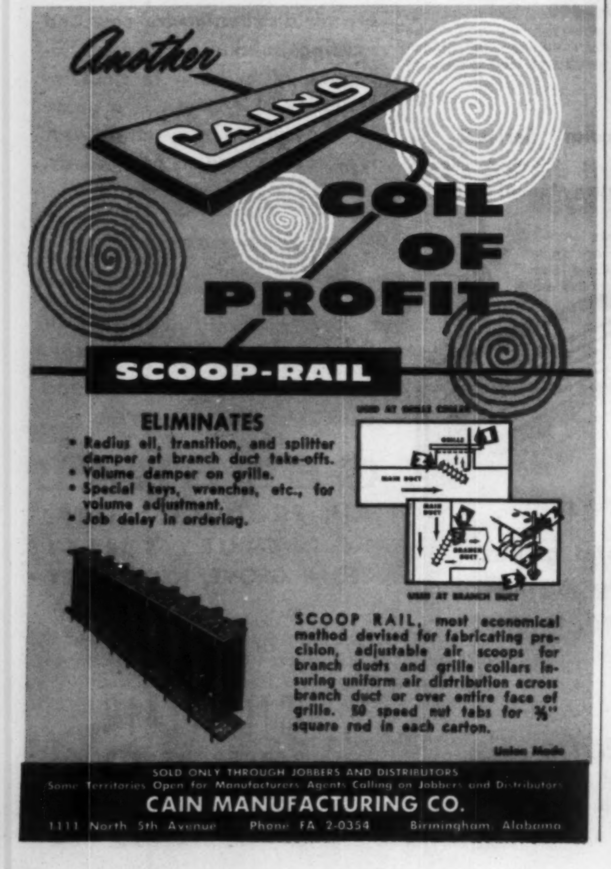

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- Radius ell, transition, and splitter damper at branch duct take-offs.
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SCOOP RAIL, most economical method devised for fabricating precision, adjustable air scoops for branch ducts and grille collars insuring uniform air distribution across branch duct or over entire face of grille. 50 speed nut tabs for ⅜" square rod in each carton.

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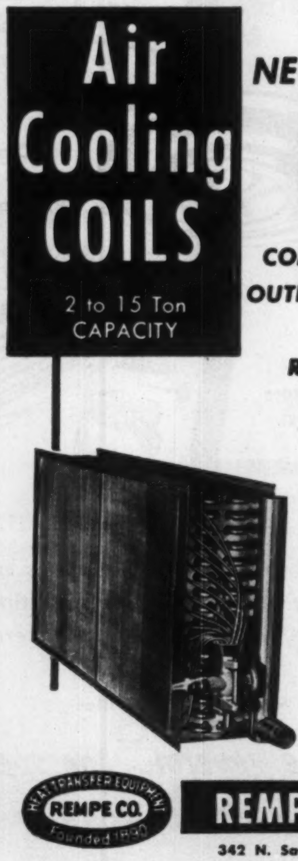

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COMPLETE WITH MULTI-OUTLET EXPANSION VALVES MADE-ON— READY TO INSTALL

4 Row Coils — for residential jobs.

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Precision built to insure top performance and to give trouble-free service.

Write for bulletins and prices.

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No matter what the specifications of your heating or air-conditioning duct work, Weirkote will meet them as only a quality zinc-coated steel can. No other metal can match it.

Take, for instance, the strength and rigidity of Weirkote. It's a natural for spanning large areas without bending or buckling and with a minimum use of supporting brackets. Consider, too, its fire protection. Its higher melting point makes it provably safer than competing metals. Since ducts sometimes carry volatile matter with a low flash point, this protection can be vital.

Important, too, is Weirkote's economy. Made by the continuous process which integrates zinc and steel, Weirkote can be worked to the very limits of the steel itself without flaking or peeling. Permanent corrosion resistance is provided in every seam and surface. Which, of course, all adds up to longer, maintenance-free life for Weirkote ducts. And its ease of installation cuts cost still further.

After a Weirkote duct installation is in and operating, your clients will find still another reason to be glad you specified Weirkote—it's quiet. Noisy creaks and cracks of expansion and contraction are minimized. With all these advantages plus economy, you just can't go wrong with Weirkote.

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Send for the new booklet on Weirkote today. Write Weirton Steel Company, Dept. M-4, Weirton, W. Va.

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Reliance
EYE-HYE

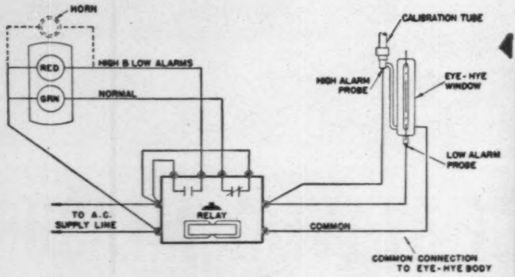
Why not *triple* your boiler water level safety!

Remote reading Reliance EYE-HYE gives you extra sound and sight alarms when you add the Levalarm

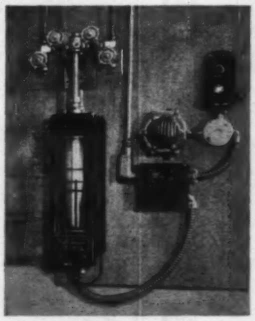
Improve the safety of water level supervision *even more* than EYE-HYE's recognized remote reading advantages; add *extra alarms* at small cost. Reliance electrode Levalarm EA9 augments the illuminated sharp-reading EYE-HYE with vibratory horns or signal lights, or both. They work instantly to alert operators when water levels reach danger points.

The boiler water itself calls the signals! Stainless steel electrodes with teflon insulation pick up a tiny current. Sensitive relays make or break independent circuits that operate the alarms. Levalarms work on low pressure or high.

Reliance Light Indicators, 2-light or 3-light, show green for normal water level — red for dangerous low or high condition. Horns are sturdy noise producers that demand action . . . Low alarm Levalarm can be installed on most EYE-HYEs in service. High alarm facility must be added at our factory. Send EYE-HYE serial number and ask for catalog section C6.



Wiring diagram for high and low alarm hook-up with 2-light indicator and/or horn.



Example of compact hook-up—EYE-HYE with horn and 2-light indicator. The extra signals can be placed any desired distance from the EYE-HYE.

Electrodes used in Levalarm EA9 withstand effects of high temperatures. Require no adjustment.

The Reliance Gauge Column Co., 5902 Carnegie Ave., Cleveland 3, Ohio

Reliance EYE-HYE

Remote Reading Gage

All-hydrostatic • Reads like a tubular glass gage

SAVE TIME—
SAVE MONEY
with these dependable
INSULATION
HANGERS

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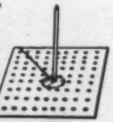
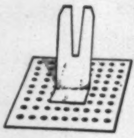
Spindle Hangers and
W-A Self-Locking Washers

Ideal for insulation work, Gemco Spindle Hangers are easily and quickly installed . . . with positive adhesion to concrete, brick or metal. W-A Self-Locking Washers pressed over spindles with minimum effort and lock insulation securely in place.



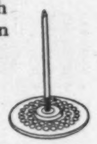
GEMCO Pronged Hangers

Designed especially for supporting various types of block insulation. Easily applied for positive adhesion. Prongs (available in various lengths from 1³⁄₁₆" to 6⅞") bend over to hold insulation firmly in place.



TUFF-WELD Nylon Hangers

Two-piece hangers . . . with bases of tough, mold nylon and spindles of metal. Made especially for smooth surfaces. Spindles snapped into bases as needed; reduces inventory, storage space, freight costs. W-A Self-locking washers hold insulation securely in place.



TUFF-BOND Quik-Set Adhesive (for smooth or slightly irregular surfaces) and General Purpose Adhesive (for rougher surfaces) assure permanent adhesion of hangers when used as directed. Write or wire for details and specifications.

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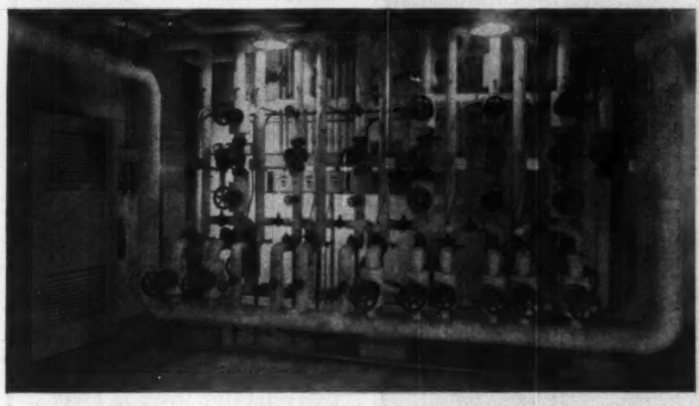
Notre Dame Hospital, Manchester, New Hampshire

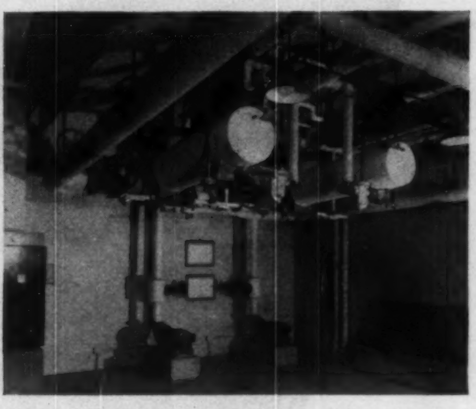
WHERE *QUIET* VIBRATIONLESS OPERATION IS ALL-ESSENTIAL—

B&G PUMPS

ARE THE PREFERRED UNITS



Secondary heating circuits are circulated by this battery of B&G Booster Pumps.



The piping of the primary circuit does not leave the apparatus room and is circulated by B&G Universal Pumps.

Architect: Leo P. Provost, A.I.A., Manchester, N. H.
Engineer: Romeo P. Morin, P.E., Manchester, N. H.
General Contractor: Harvey Construction Co., Inc., Manchester, N. H.
Heating Contractor: R. C. Peabody, Inc., Manchester, N. H.

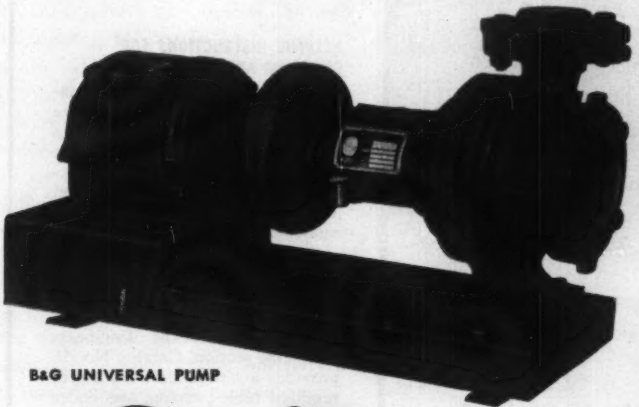
This installation illustrates two important factors in the design of a satisfactory forced hot water heating system.

First, it employs primary and secondary pumping—a design arrangement developed by B&G for more accurate control of temperatures. As shown in the photos, B&G Universal Pumps circulate the primary mains and B&G Boosters circulate the secondary circuits supplying seven zones.

Second, the B&G pumps selected are noted for *quiet* operation—an all-important consideration. Transmission of pump noise through the piping system can penalize the most careful designing and installation.

B&G Booster and Universal Pumps are engineered and built to meet the exacting demands of water heating and cooling systems. These are not run-of-mine centrifugal pumps... they are distinguished by numerous features which assure *silent, vibrationless* operation. Among these are specially built, more costly motors, tested for quietness—oversized shafts of hardened alloy steel—long sleeve bearings—noise dampening spring couplers—oil lubrication and leak-proof mechanical seals.

That's why B&G Circulating Pumps are *preferred*... they're *quiet where silence counts!*



B&G UNIVERSAL PUMP

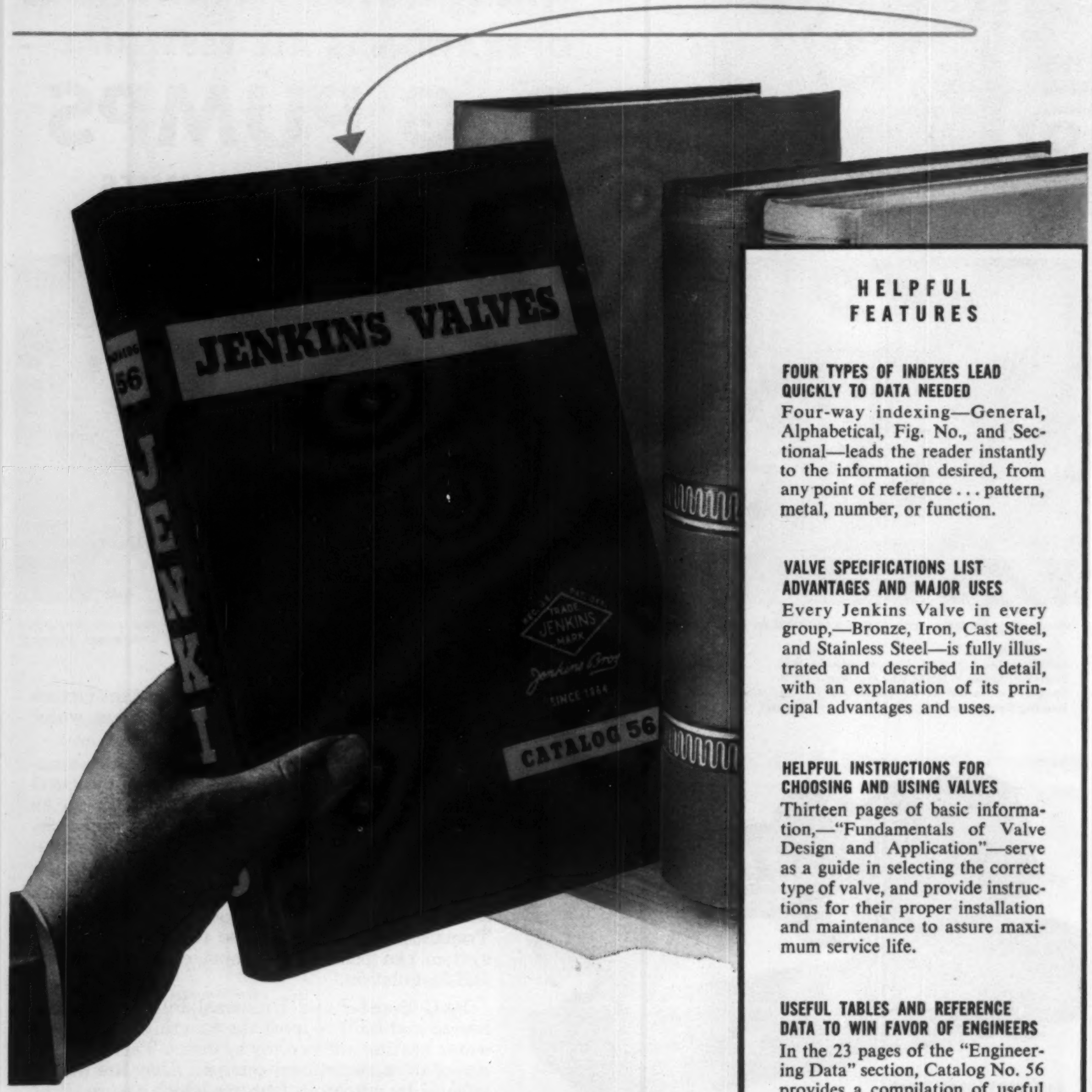
B&G BOOSTER PUMP

Hydro-Flo SYSTEM

Reg. U.S. Pat. Off.

BELL & GOSSETT COMPANY
Dept. FG-5, Morton Grove, Ill.
Canadian Licensee: S.A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

DO YOU HAVE THIS HELPER?



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VALVES
JENKINS SINCE 1864 Jenkins Bros

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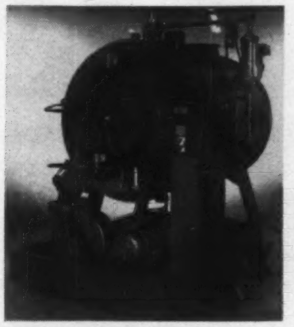
EQUIPMENT DEVELOPMENTS . . .

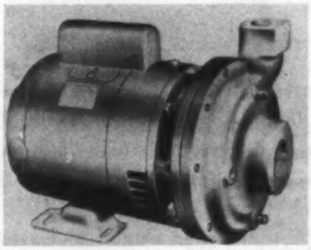
For reviews of Recent Trade Literature see Page 254



Packaged Boilers . . .

. . . with wet back design added to other design features — *York-Shipley, Inc., Dept. HPAC, 500 Jessop Pl., Box 349, York, Pa.*

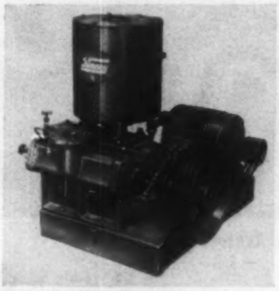
Four new boilers, rated at 20, 30, 40, 50 hp, have new design and may be ordered to supply high pressure steam (125 psi), low pressure steam (15 psi) or hot water (30 psi). Boiler's wet back feature, a circular water chamber at rear head, carries off excess heat, permits operation at higher rating for physical size. Any of four models can be installed in floor space 4 × 7 × 6 ft high. Each has less than 100 sq ft heating surface, slightly less than 3 sq ft equivalent grate area. Boilers may be fired with light or heavy fuel oil, natural or mixed gas, or both oil and gas.



Centrifugal Pump . . .

. . . of volute type for horizontal or vertical installation as circulator in hot water system, chilled water air conditioning system, cooling tower — *Dunham-Bush, Inc., Dept. HPAC, 179 South St., West Hartford 10, Conn.*

Mechanical construction of "Type A5" includes ball bearing dripproof frame with conduit box, screwdriver holding slot in shaft end opposite centrifugal pump. Shaft, mounting flange comply with NEMA standards. Electrical system includes dual voltage, 115/230 single phase 60 cycle built-in thermal overload protection. For three phase, 60 cycle 208/220/440 is furnished. Available in 13 sizes 1/3 hp to 2 hp, capacities to 150 gpm.



Air Vacuum Pumps . . .

. . . for 65 and 80 cfm applications— *Kinney Mfg. Div., New York Air Brake Co., Dept. HPAC, 3529 Washington St., Boston 30.*

"KDH-65" single stage mechanical pump uses 3 hp, 1800 rpm motor. "KDH-80" single stage mechanical pump uses 5 hp, 1800 rpm motor. Both have duplex design and are gas ballasted.

Titanium Piping Fittings . .

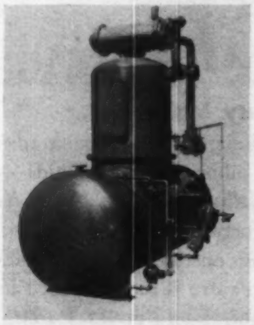
. . . to match schedules and sizes of titanium piping now made — *Tube Turns, Div. of National Cylinder Gas Co., Dept. HPAC, 224 E. Broadway, Louisville 1.*

Company's line of welding fittings and flanges intended for use in chemical processing, anodizing, petroleum, marine, food processing, other industries. Titanium weighs 56 percent as much as stainless steel, withstands temperatures to 850 F. Resists corrosion by nitric acid, wet chlorine gas, solutions of chlorine, chlorinated organic compounds, inorganic chloride solutions, salt water and marine atmosphere.

Oil Burner . . .

. . . designed for clean, quiet, economical operation—*Sun-Ray Mfg. Corp., Dept. HPAC, 139-24 Queens Blvd., Jamaica 35, New York.*

"Model S-3" has capacity 6 to 10 gph, features aerodynamic housing for special combustion head. Delayed action oil valve, built-in electronic controls mounted and wired are standard equipment. Unit also includes thermostat, standard limit control.

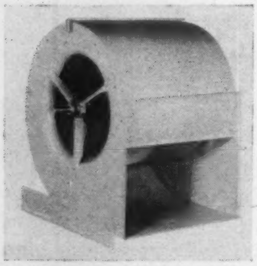


Feedwater Heater Control

. . . designed to automatically switch on secondary water supply when primary source is interrupted—*Stickle Steam Specialties Co., Dept. HPAC, 2215 Valley Ave., Indianapolis 18.*

Heaters have dual liquid level control with high, low water alarms.

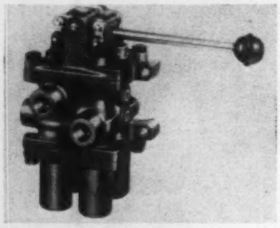
Control is available on all of company's deaerating and non-deaerating feedwater heaters.



Centrifugal Fan . . .

. . . designed to give higher maximum rpm rating with less impedance to air flow — *Lau Blower Co., Dept. HPAC,* 2027 *Home Ave., Dayton* 7.

"Series A" fan assembly has 18 in. diam centrifugal fan wheel. Each blade mechanically attached to center disc by four individual steel fingers pressed within blade. Extra 3/8 in. added to end ring for more rigidity and to bear stress of higher speeds. Fan will operate in excess of 1000 rpm at static pressures of 2½ in. water gage or better, company says. Air delivery rated at 3200 to 8000 cfm.



4-Way Valve . . .

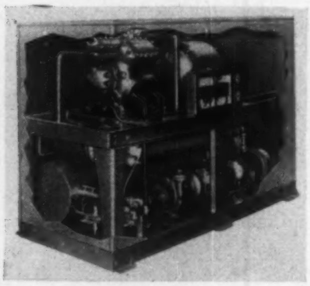
. . . designed for use with raw cold water, oil or glycol-base fluids — *Sinclair-Collins Valve Co., Dept. HPAC,* 454 *Morgan Ave., Akron* 11.

Lever operated, ½ in., 1000 psi, neutral valve is recommended for use in controlling press loading lift tables, similar operations where tight sealing and leak-free operation are required. All ports are closed in neutral position. Valve body is "Navy M" bronze, seats and stems are stainless steel, centering springs are inconel. Three 7/16 in. mounting holes are provided.

Room Air Conditioners . . .

. . . with increased cooling power— *York Corp., Subsidiary of Borg-Warner Corp., Dept. HPAC, York, Pa.*

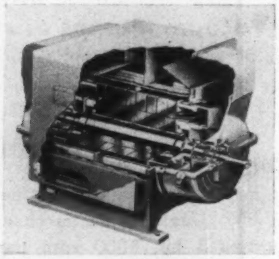
Each of nine new models increase cooling capacity approximately 30 percent while decreasing size of unit 63 percent, manufacturer says. Sizes range 1 to 2 hp in cooling capacity. "Power Mite," designed to cool space 1428 times its size, is 22 in. wide, 14 in. high, 14⅞ in. deep.



Package Chiller . . .

. . . in sizes 7½ to 150 tons capacity — *Bell & Gossett Co., Dept. HPAC,* 8200 *N. Austin Ave., Morton Grove, Ill.*

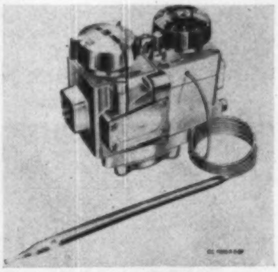
All major components of chiller designed, built by the company. Features cited: low center of gravity, easy accessibility. Among components built by manufacturer: chiller, molded styrene chiller insulation, condenser, heat exchanger, control boxes, control panels, chiller pump, chiller pump motor, condenser pump, condenser pump motor, water relief valve, frame, jacket.



Weatherproof Motors . . .

. . . designed for outdoor operation under extreme weather conditions — *Louis Allis Co., Dept. HPAC,* 427 *E. Stewart St., Milwaukee* 1.

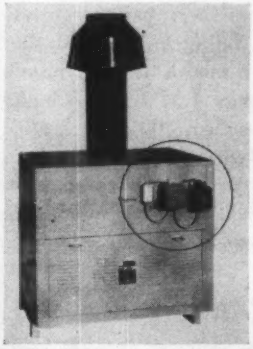
In ratings from 250 to 1500 hp. Intended for use in chemical, petroleum, paper processing, public utilities industries; also in pipeline, boiler feed pump, other outdoor industrial applications. Ventilation system prevents entrance of particles and moisture by forcing incoming air stream through number of abrupt changes in direction, sharp decreases in velocity, says manufacturer.



Gas Heating Control . . .

. . . developed to convert from manual to hydraulic bulb thermostat or electrically operated room thermostat— *Grayson Controls Div., Robertshaw-Fulton Controls Co., Dept. HPAC, Long Beach, Calif.*

Any of four units may be added to "Unitrol 1000": snap action, self-contained hydraulic thermostat; snap full-on, snap-off to bypass hydraulic thermostat; snap-on to high flame—throttle down to bypass—snap-off hydraulic thermostat; room thermostat silently operating gas valve (24 volts). Gas pressure regulator optional on all models.



Controls for Boilers . . .

. . . designed to provide automatic shutoff in case of pilot failure— *Raypak Co., Inc., Dept. HPAC,* 2416 *Chico Avenue, El Monte, Calif.*

Electronic pilot shutoff and safety pilot control also includes electric pilot ignition. Shutoff action is automatic, within 8/10 of a second, says manufacturer.

UNITENSION V-BELTS

UNITENSION... free of vibration!

Unitension® V-Belts bring vibration to the vanishing point. These "U. S." advanced developments make Unitension V-Belts the most remarkable V-Belts of today.

- "U. S." exclusive pulling cords are built in under tension by errorproof electronics ..each cord pulls its full share of the load, prolongs belt life.
- New molding methods produce smoothest frictioned surface engineered on any V-Belt. Result is new standards of quietness and balance—vibration is virtually eliminated.
- Made in the world's largest, most modern transmission belt factory.
- Designed by a staff of power transmission technicians unsurpassed in skill and experience.

• • •

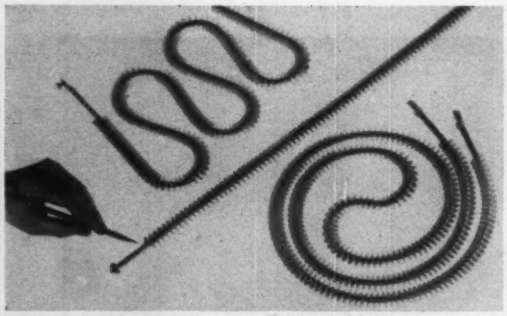
When you think of rubber, think of your "U.S." Distributor. He's your best on-the-spot source of technical aid, quick delivery and quality industrial rubber products.

Mechanical Goods Division

United States Rubber

Rockefeller Center, New York 20, N.Y.

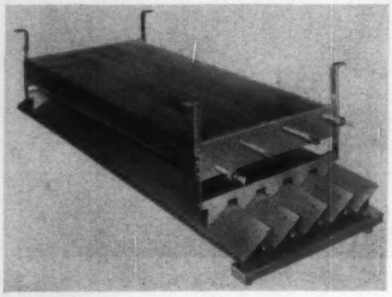
In Canada: Dominion Rubber Company, Ltd.



Electric Finned Tubular Heaters . . .

. . . designed to provide rapid open coil heatup, with advantage of enclosed, insulated construction—*Edwin L. Wiegand Co., Dept. HPAC,* 7500 *Thomas Blvd., Pittsburgh* 8.

Element of this small mass heater for forced convection air heating, "Chromalox Microfin", is ¼ in. diam; fins are furnace brazed for homogeneous construction. Watt density of heater is 80 per sq in. on steel or alloy sheath. Standard heated lengths range 5½ to 47½ in. Voltages are 120, 240, with wattages 525 to 3000. Special lengths, voltages, wattages available.



Baffle Coils . . .

. . .delivered as complete unit—*Larkin Coils, Inc., Dept. HPAC,* 519 *Memorial Dr., S. E., Atlanta, Ga.*

Unit consists of aluminum cross-fin coil, double-louvered baffle with drain pan, hangers. Baffles constructed of heavy gage, polished aluminum, easily removed for cleaning, may be raised or lowered to suit installation, says manufacturer. Special sized coils available on special order, may be fabricated in finned lengths from 36 to 180 in. and increments 6 in., with ⅜ or ½ in. fin spacing.

Explosionproof Temperature Control . .

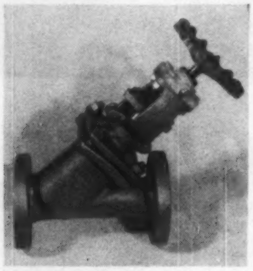
. . . for use in hazardous locations where explosive vapors and gases are present — *United Electric Controls Co., Dept. HPAC,* 79 *School St., Watertown* 72, *Mass.*

"Type E98A" 's two separate switches permit switch action above or below set point, control of two independent circuits, great flexibility of switching arrangement. Thermal system consists of bulb, capillary, bellows filled with temperature sensitive liquid. Standard head compensation provided is effective from −65 to 160 F. Switches available rated for 15 amps at 115 or 230 volts a-c; other ratings also available. All switches are single pole and suitable for 180 F ambient temperature.

Temperature-Operation Recorder . . .

. . . with second pen for recording electrical operation — *Bacharach Industrial Instrument Co., Dept. HPAC,* 200 *N. Braddock Ave., Pittsburgh* 8.

Two-pen instrument is made in two standard temperature ranges: −30 to 50 F, −30 to 120 F. It is available for either series or 110/220 volt a-c or d-c parallel operation connection. The instrument is equipped with a 6 ft electrical cord for operation recording and a temperature sensitive bulb at the end of 6 ft of flexible capillary tubing for remote temperature readings. Chart drive is 24 hr instrument-type clock movement.



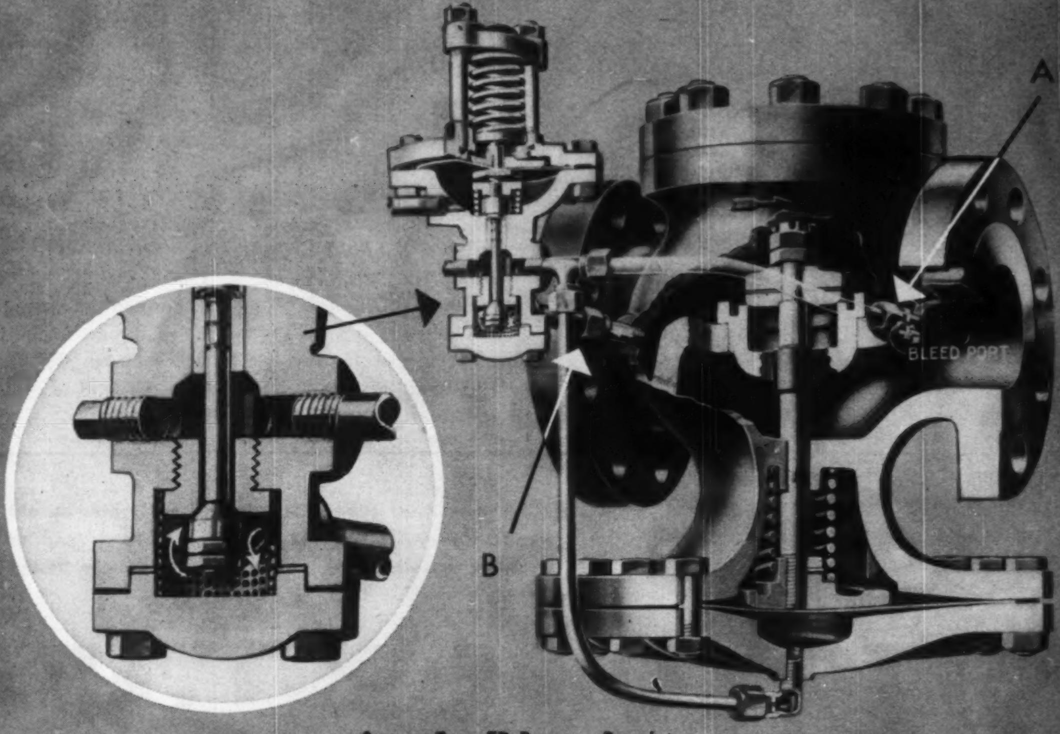
Stainless Steel "Y" Valves . . .

. . . with extra lift to remove disc from flow area and minimize line entrapment, pressure drop — *Cooper Alloy Corp., Dept. HPAC, Bloy St. and Ramsey Ave., Hillside* 5, *N. J.*

Valves are produced in ½ to 3 in. screwed and socket weld and ½ to 8 in. flanged, and operate in the pressure range from vacuum to 275 psi at temperatures to 750 F. Standard disc material is plastic; other materials available. Valve bodies available in stainless steel types 304, 316, 347, FA-20, nickel, monel and ELC versions, are x-ray quality castings. Recommended for use with corrosive chemicals, petroleum products, spirits, gases, slurries.

VALVE TIPS:

Advantages of External Pilots in Automatic Regulating Valves



Spence Type ED Pressure Regulator

"Maintenance-free, trouble-free, install-and-forget." They're all pretty phrases, but every engineer knows from experience they don't apply to regulating valves. Any valve designed to control temperatures or pressures within tight limits can be affected by dirt or other foreign matter in steam lines.

One advantage of the external pilot mounting shown above is simplified maintenance. Trouble shooting is faster, downtime is reduced, and tempers don't take such a beating. Here's why:

If trouble develops, it's easy to find out if it's in the pilot or the main valve. Just remove the tubing bend at A. A simple test, without any instruments or other equipment, shows where the trouble is.

If the trouble is in the pilot, you can remove it by disconnecting the unions at B. There's no need to take the main valve out of the line.

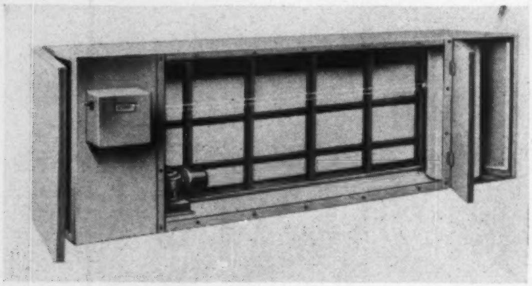
The quickest way to get the regulator functioning again is to install a spare pilot. This is easy — and in the Spence design it's not expensive to carry spare pilots. Spence pilots fit all sizes of Spence main valves. There's no need to stock an expensive inventory of pilots for each main valve size.

In the enlarged sectional drawing above, you can see how the strainer, seat and disc of the pilot are readily accessible by removing the blind flange.

If the trouble is in the main valve, here again inspection is easy. If there's dirt in the steam line, it may clog the bleed port or restriction orifices. In the Spence design these can be inspected and cleaned by merely removing the tubing connections. The seat and disc of the main valve can also be inspected easily by removing the top flange.

These maintenance advantages, plus other advanced design features, are available for a wide range of regulating applications. For information on Spence's wide range of different automatic regulating valves, write for your copy of Bulletin 1005.

SPENCE ENGINEERING COMPANY, INC.
Walden, New York



Automatic Air Filter . . .

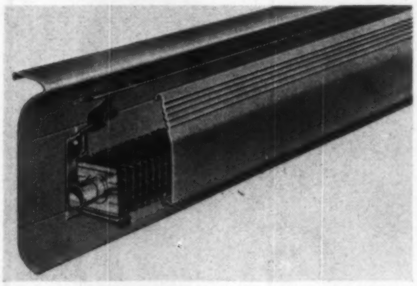
. . . designed as attachment for all types, models of air handling units—*Farr Co., Dept. HPAC, P. O. Box 45187, Airport Sta., Los Angeles 45.*

"Roll-Kleen Type H" filter has heavy gage metal frame, holding replaceable roll of glass fiber filtering media, power driven take-up spool. Electrical controls govern automatic movement of media across face of filtering area. Features cited: high or low velocity; large dirt holding capacity; large filtering area in relation to unit's size.

Chilled Water Air Conditioning Units . .

. . . designed to permit installation in air conditioned space with little or no ductwork — *Hastings Air Control, Inc., Dept. HPAC, 3215 Leavenworth St., Omaha.*

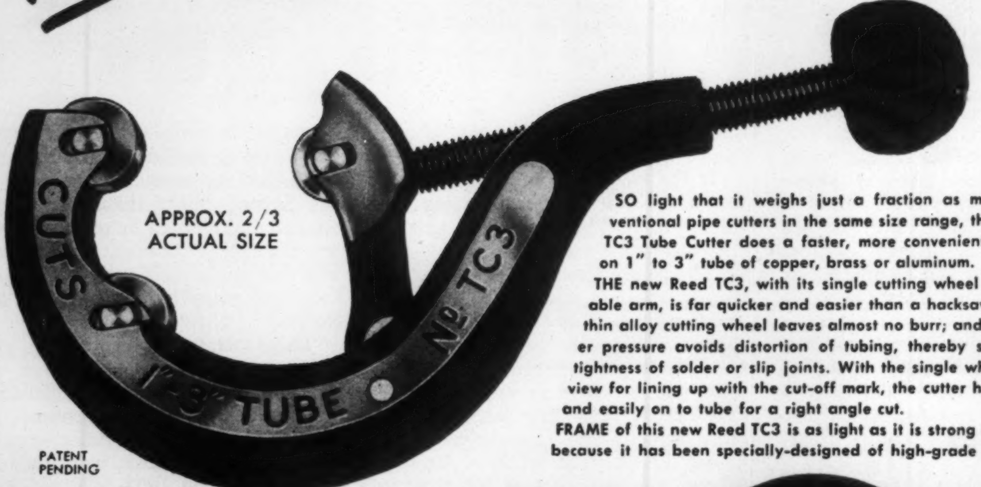
These 1000 to 3500 cfm air handling units are connected with water pipes to a central chiller for cooling and a boiler for heating. Units available with 4 and 6 row coils, header or serpentine circuiting, aluminum or copper fins. Top plenum sections have four-way louver grilles for direct discharge from front, sides. Units without plenum sections used with ductwork.



Radiant Baseboard Convector . . .

. . . designed for greater strength, ruggedness, resistance — *Spi-Rol-Fin Corp., Dept. HPAC, 133 Greenwood Ave., Pequannock, N. J.*

"Box-Fin" heating element is formed by expanding normal tube to press fit and accordian pleated finning. Element can be supplied with cover lengths precut from 2 to 20 ft in 1 ft increments for wall to wall installations.



● This new Reed Tube Cutter—a faster, lighter-weight roller cutter—is the first cutter for 1" to 3" copper tubing; equally ideal for brass and aluminum tubing from 1" to 3".

New TC3 TUBE CUTTER!

APPROX. 2/3 ACTUAL SIZE

SO light that it weighs just a fraction as much as conventional pipe cutters in the same size range, this new Reed TC3 Tube Cutter does a faster, more convenient cutting job on 1" to 3" tube of copper, brass or aluminum.

THE new Reed TC3, with its single cutting wheel in the movable arm, is far quicker and easier than a hacksaw; the ultra-thin alloy cutting wheel leaves almost no burr; and TC3's lighter pressure avoids distortion of tubing, thereby safeguarding tightness of solder or slip joints. With the single wheel in plain view for lining up with the cut-off mark, the cutter hooks quickly and easily on to tube for a right angle cut.

FRAME of this new Reed TC3 is as light as it is strong and durable because it has been specially-designed of high-grade ductile iron.

PATENT PENDING

REED MANUFACTURING COMPANY ERIE, PA., U.S.A.

the quality tells . . . the quality sells

JANITROL

year 'round
air conditioner

Fits in as little as $3\frac{3}{5}$ square feet!
Features Dura-Tube Gas Heating Heart
and powerful air-cooled cooling.

the Wraps are off...

and from this day on the new

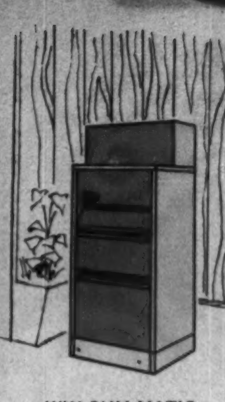
JANITROL

WIN-SUM-MATIC

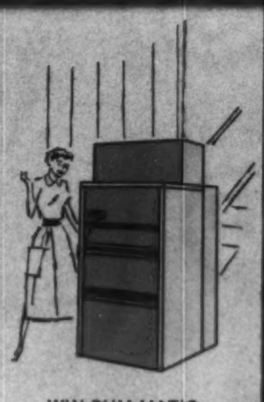
Year-round air conditioner

is the one to sell and grow with!

New Janitrol Win-Sum-Matic with front panels removed to show compact design and complete accessibility from front.



WIN-SUM-MATIC
Model CVC-85
with bottom
filter cabinet.



WIN-SUM-MATIC
Model CVC-85
with back
filter cabinet.

Take the very finest in year 'round air conditioning equipment and make it *even better!* That's what Janitrol has done and this all-new Win-Sum-Matic is the proof.

Here in one compact "package" is surpassing new beauty with wonderful new refinement and elegance of line and color . . . "the look of the future".

Here is new quietness of operation, with thrift that far exceeds accepted standards . . . a whole new concept of efficiency and dependability in performance.

Here is new ease and convenience in installation . . . new flexibility in the wide range of blower and motor combinations . . . new freedom of service and adjustment accessibility. Here, in fact, is everything you need and more to get your share of the booming air conditioning market.

Take a few minutes now to look over the features and advantages only Win-Sum-Matic offers. Then, ask your Janitrol representative—or mail coupon—for full details on how you, too, can sell and grow with Janitrol!

feature-packed for a mighty Sales Punch!

WIN-SUM-MATIC by Janitrol

New, Slim "Look of the Future"! New crisp, clean, uncluttered rectangular design with flush front enhances built-in effect . . . saves valuable floor space. New warm-tone neutral colors with gold accent complement decor of any room—harmonize with other appliances.

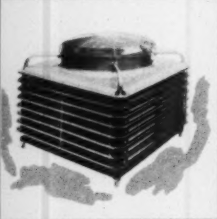
New, Compact Cabinet. Height of Win-Sum-Matic CVC120-85 (Combination L) is only 6'-8" including outlet plenum. Width 22½", Depth 40". Easily installed in basements with 7' ceilings. Plenum has knockouts on both sides and front for horizontal take-off.

Complete Accessibility from Front. All internal parts are easily reached, simply by removing front panels. Snap-lock panel design. No screws.

Exclusive Season Selector Control. An internal air bypass damper, operated manually or by motor automatically with control by thermostat, provides correct air for heating or cooling without blower adjustments. Damper directs air over heat exchanger for heating, and directly from blower into outlet plenum and evaporator for cooling.

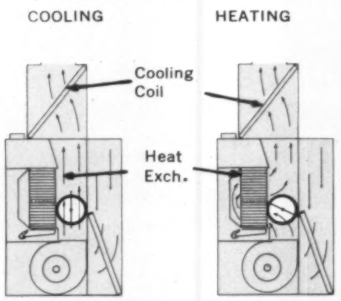
Exclusive PRIDE O' YARD

Compressor-Condenser Unit



Special louvered design allows air circulation from all sides while shading condenser from sun at all times . . . boosts efficiency and economy of operation. Rugged, weatherproof construction, with every necessary safeguard for protection of children and pets.

AIR FLOW DIAGRAMS WIN-SUM-MATIC with Back Filter Cabinet



SEASON SELECTOR (circled) allows straight-through air flow from blower to cooling coil for cooling . . . in winter, directs air through heat exchanger twice for maximum heat extraction.

Exclusive Dura-Tube Heating Heart

Warranted **20 years!** Born of the jet age! New A-19 armor coating, used to protect aircraft engine parts from corrosive, ravaging hot exhaust gases, is fused into all internal and external surfaces and joints—assures permanent sealing, new freedom from corrosion and burn-out. Twin-pass air flow design gives more heating capacity in less space, air passes over heat exchanger surfaces **twice**, resulting in higher heat absorption, true heating economy.

New Waterless Cooling Heart. Compressor-condenser needs only air and electricity, operates at lowest cost. Eliminates water supply and sewage requirements. Reduces service problems. Provides cooling with outside temperatures to 125° F.

New Quietness in Operation. Acoustically treated blower chamber, cushion mounted blower and blower motor, full-floating heat exchanger and air-cooled side panels provide a new concept quiet, smooth performance without annoying vibration or expansion-contraction noises.

Wide Range of Blower and Motor Combinations. Special, new blowers with alternate motors for each size of unit to furnish air deliveries for different cooling capacities in each model—greater installation flexibility.

Sizes to Heat and Cool Any Home. Models with heating input 80,000 to 200,000 Btu. Cooling output 22,000 to 76,000 Btu. AGA approved for natural, mixed or LP gas. (Ask about special approvals for commercial applications.)

Sell and Grow with JANITROL

Ask your Janitrol representative for all the facts, or RUSH the coupon to us today!

From JANITROL—a complete line of gas and oil furnaces, unit heaters, conversion burners, air-cooled summer cooling conditioners, combination heating-cooling conditioners.

JANITROL HEATING AND AIR CONDITIONING DIVISION
Surface Combustion Corporation, Columbus 16, Ohio
In Canada: Moffats Ltd., Toronto 15

Please show me how I can sell and grow with the new Janitrol WIN-SUM-MATIC year 'round conditioners and other quality-built Janitrol products for home comfort.

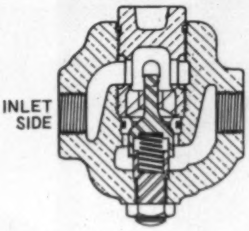
Name____________________

Company____________________

Address____________________

City________________Zone______State________

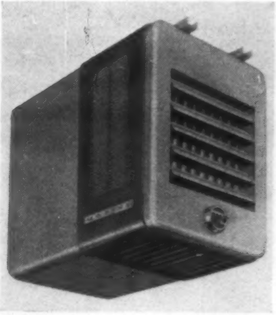
Fill in and MAIL TODAY. No obligation.



Check Valves . . .

. . .especially designed for oil or water service—*Sinclair-Collins Valve Co., Dept. HPAC,* 454 *Morgan Ave., Akron* 11.

Line of 4000 psi valves have inverted seat design. According to manufacturer, downward flow through seat ring keeps sealing surfaces free of foreign particles. Flow area is equal to or greater than transverse area of nominal size extra heavy pipe. Available in sizes ½ to 2 in. Valve body and seat retainer are Navy M bronze; seat, stem, guide are stainless steel; spring is of inconel.



Gas Fired Unit Heater . . .

. . .designed for suspended installation in room to be heated or in adjacent room—*Modine Mfg. Co., Dept. HPAC,* 1509 *DeKoven Ave., Racine, Wis.*

"Series GB" is available in seven sizes, 50,000 to 310,000 Btu per hr. Burners constructed of die-formed stainless steel. Aluminized steel heat exchanger has individually fired tubes. Access to controls and burner through removable side panels, hinged casing bottom. Units have belted fan duty type motors with adjustable pulleys for varying blower speed below 900 rpm maximum.

ACE Plastic Pipe

85 to 100% of your corrosion-resistant piping needs now available from 1 source

- CHOICE OF 9 DIFFERENT TYPES
- THE NEWEST OF MATERIALS
- BACKED BY 100 YEARS OF EXPERIENCE

HOW TO SELECT THE RIGHT PIPE

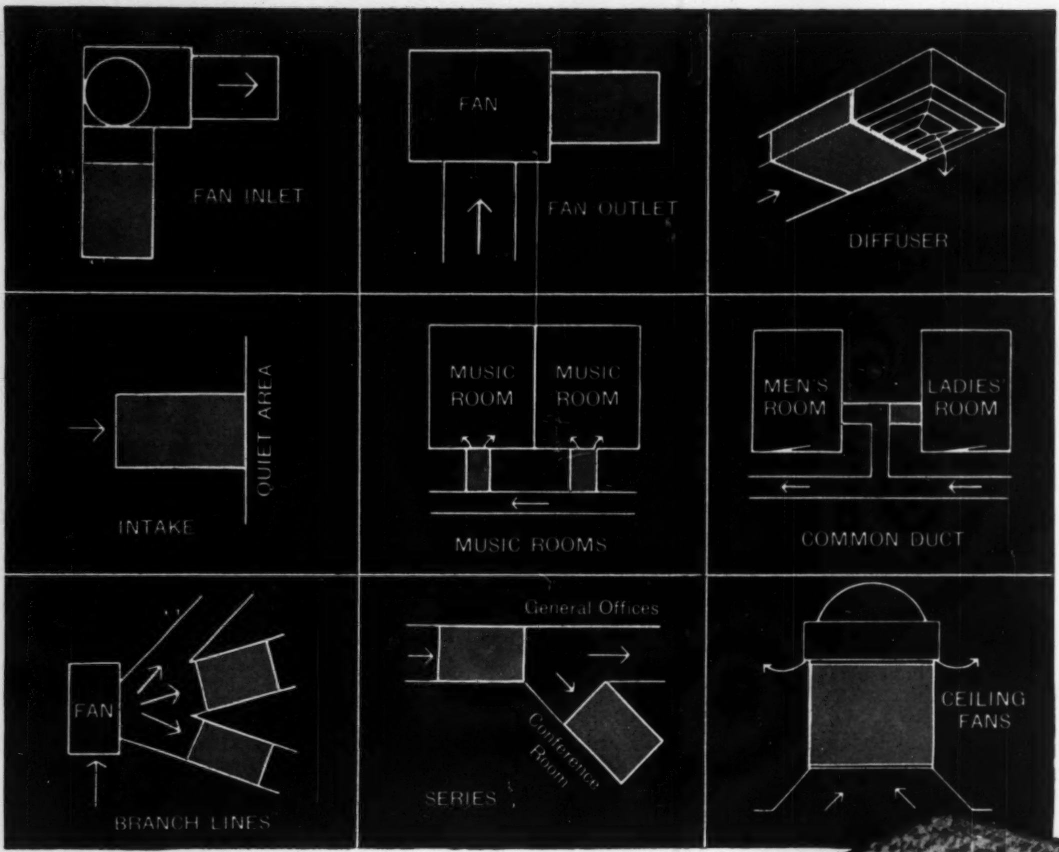
TYPE	SIZES	PROPERTIES	VALVES	ASK FOR BULLETIN
1 ACE-ITE	Threaded Pipe ½ to 6″	General purpose rubber-plastic blend. Tough, impact resistant, economical. Handles most common chemicals to 170°F.	Diaphragm valves with Ace-Ite body, ½ to 2″	80-A
2 RUBBER-LINED STEEL	Flanged Pipe 1½ to 24″ and up	Strength of steel, resistance of hard rubber. Soft-rubber inter-layer aids shock-resistance. Finest for alkalis, most inorganic acids, many organic acids, all salts.	Rubber-lined C.I. Gate, Darling Gate & Check Valves to 24″. Diaphragm Valves to 6″	CE-52
3 ACE TEMPRON	Threaded Pipe 1 to 8″	Best anywhere for hot inorganic chemicals, acids, etc. to 260-275°F. Also wide variety of organics. Excellent rigidity.	——	96-A
4 ACE RIVICLOR	Threaded Pipe ½ to 4″	Rigid PVC. Excellent aging. Good cold impact strength. Not affected by most inorganic acids and alkalis. Also good for many organics.	Diaphragm valves with Riviclor body ½ to 2″	CE-56
5 ACE PARIAN	Threaded Pipe ½ to 2″	Odorless, tasteless, rigid polyethylene, best for sub-zero uses. Best resistance of any plastic at room temp. except to acetic acid.	Diaphragm valves with Parian body, ½ to 2″	351
6 ACE HARD RUBBER	Threaded ½ to 4″ Flanged 1½ to 8″	The oldest, still tops. Extreme resistance to alkalis, inorganic acids, many organics, all salts. Ideal for chlorine, fluorine. Widest range of fittings.	Rubber-lined or plastic valves above. Also many plug valves, bibb cocks, etc.	CE-51
7 ACE SARAN	Threaded Pipe ½ to 4″ Tubing ⅛ to 1¼″	Odorless, tasteless, general-purpose. Strong, takes high pressures. Not affected by most inorganic acids and alkalis; resistant to most organics.	Diaphragm Valve with Saran body ½ to 2″. Also Saran-lined diaphragm valves to 6″ and up	CE-58
8 ACE-FLEX	Flexible Tubing ⅛ to 1¼″	General-purpose transparent flexible tubing. Non-toxic, odorless, tasteless. Can steam sterilize. Excellent for chemicals.	Ace hard rubber plug valves, bibb cocks, etc.	66
9 SUPPLEX	Flexible Pipe ½ to 2″	Non-toxic flexible polyethylene pipe. Ideal for water distribution lines, drain lines, jet wells, etc. Resistance similar to Parian. Uses insert type fittings.	Diaphragm valves with Parian body, ½ to 2″	CE-57

ACE Saran, Supplex, Ace-Ite and Riviclor are approved by The National Sanitation Foundation for drinking water.

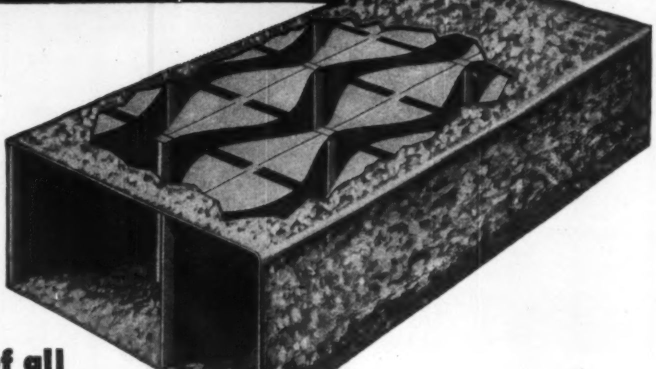
RUBBER AND PLASTIC LINED TANKS, PUMPS, MOLDED PARTS, ETC., FOR ANY NEED

AMERICAN HARD RUBBER COMPANY
Division of Amerace Corporation
ACE ROAD • BUTLER, NEW JERSEY

SEE ACE EQUIPMENT IN CHEMICAL ENGINEERING CATALOG


FAN INLET
FAN
FAN OUTLET
DIFFUSER
QUIET AREA
INTAKE
MUSIC ROOM
MUSIC ROOM
MUSIC ROOMS
MEN'S ROOM
LADIES' ROOM
COMMON DUCT
FAN
BRANCH LINES
General Offices
Conference Room
SERIES
CEILING FANS

Every Building Needs Aircoustat Sound Traps



AIRCOUSTAT silences all noise of all frequencies traveling through ductwork

Eliminate disturbance, distraction and irritation caused by noises escaping from one area to another through ductwork.

Install AIRCOUSTAT Sound Traps. AIRCOUSTAT eliminates guesswork, wasted space and unnecessary expense of duct lining. You can guarantee your client trouble-free performance. You can estimate with complete confidence the performance of particular applications. If AIRCOUSTAT fits geometrically, it fits acoustically.

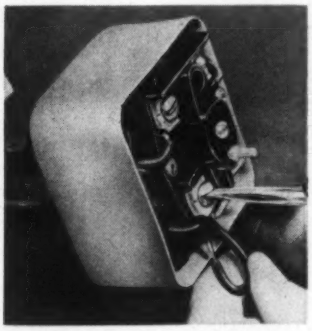
AIRCOUSTAT saves you space. Its greater effectiveness permits smaller-sized ducting. It eliminates bulky mufflers.

For more details, write to KOPPERS COMPANY, INC., Industrial Sound Control Dept., 6205 Scott Street, Baltimore 3, Md.

KOPPERS

INDUSTRIAL SOUND CONTROL

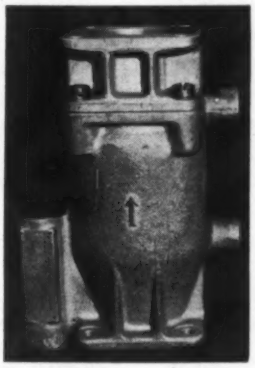
Engineered Products Sold with *Service*



Pressure Switch . . .

. . . with pressure connectors, top accessible wiring terminals, no-drift pressure settings—*Furnas Electric Co., Dept. HPAC,* 1041 *McKee St., Batavia, Ill.*

In four enclosure styles switches in "PS" series have 85 lb maximum capacity, rated through 1 hp, 110-220 volts single phase and polyphase. Recommended for use with water pumps, low pressure air compressors, other air or water systems requiring automatic control of pressure between preset limits. Pressure settings preset at factory to specifications. Adjustment screws allow adjustment or readjustment to conform to application.



Water Injection Valve . . .

. . . with pressure actuated piston design involving one spring-loaded moving part—*Whittaker Controls Div., Telecomputing Corp., Dept. HPAC,* 915 *Citrus Ave., Los Angeles.*

Valve has operating capacity of 80 gallons per min at pressure of 300 psi. Proof pressure of 862 psi; burst pressure 1100 psi. Weight of valve is 2 lb.

Which of these ventilation problems do you want solved?

General ventilation and comfort cooling? Removal of fumes, dust, heat and steam? Air circulation, rapid product cooling and drying?

Power Line

solves it these 5 ways surer:

1. Complete line: Broadest product line of air-moving equipment for every industrial requirement.

2. Certified performance: All Power Line Fans are rated by PFMA and NAFM.

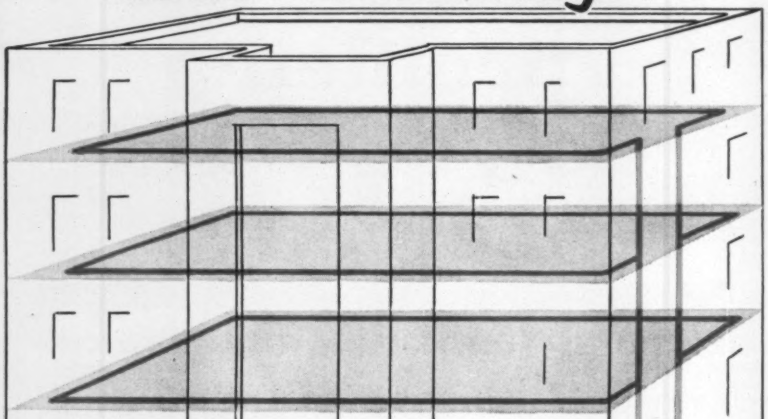
3. Backed by 33 years of specialization in manufacture of highest quality ventilation equipment.

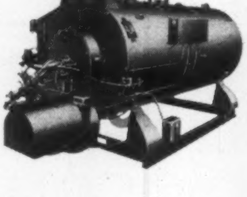
4. Competitively priced to give you important cost savings in initial investment and in maintenance. You get the precisely right product to fit your requirements. You don't over-buy with equipment too large or under-buy with equipment too small.

5. Sold only through qualified ventilation specialists. You get expert technical advice and service from the survey of your requirements right through to the completion of your installation.

YOURS ON REQUEST: Big 20-page Power Line Catalog gives complete facts about industrial ventilation, including selection of proper type and size of fan, calculation of dust resistance, and installation procedures, plus features, dimensions, specifications and performance data. Without obligation write for your free copy of Catalog No. 64B.

POWER LINE FAN COMPANY, INC.
Subsidiary of **Chelsea Products, Incorporated** 639 South Avenue, Plainfield, New Jersey





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meets the challenge!

with Hot Water Generators

Specifically designed for

Forced Circulation Systems

Cyclotherm has designed a complete new line of Hot Water Generators built specifically to meet the requirements of forced circulation hot water systems. These Generators distribute water evenly throughout the length of the pressure vessel. Every drop of water contacts an effective heating surface. No short circuits! No trapped areas! No uncontrolled temperatures! *Only* Cyclotherm offers a complete line of Hot Water Generators built for forced circulation systems.

Cyclotherm Generators are shipped ready-to-work, with one manufacturing responsibility back of the entire equipment. No foundation, no excavation, no costly stack. Burning oil, gas and a combination of oil and/or gas, Cyclotherm gives fuel economy. Electronic controls make operation automatic. Maintenance costs cut up to 50%. Capacities from 670,000 BTU per hr. to 6,700,000 BTU per hr. Cyclotherm's world-wide service organization is always at your disposal. For full information, write today.

YEARS AHEAD IN STEAM & HOT WATER GENERATION

CYCLOTHERM®
Steam & Hot Water Generators

Cyclotherm Division National-U.S. Radiator Corp.
55 E. First St., Oswego, N. Y.

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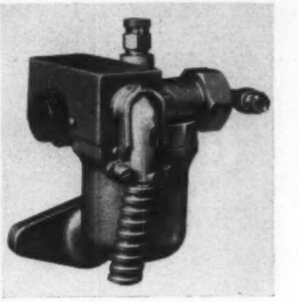
Please send me your new folder: "For The First Time . . . Package Boiler Economy for Modern Hot Water Systems."

EQUIPMENT DEVELOPMENTS

Continued



Oil Monitor . . .

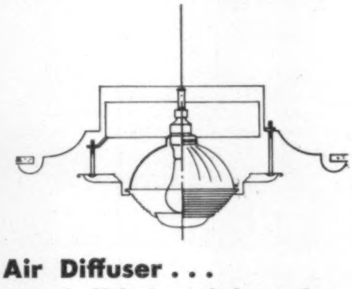
. . . developed to reduce downtime on air compressors — *Champion Pneumatic Machinery Co., Dept. HPAC, Princeton, Ill.*

This protective device prevents recycling when compressor crankcase oil level falls below safe limit, according to manufacturer. Recycling can only be accomplished by operator manually pushing button on side of unit.

Air Filter . . .

. . . of woven plastic fabric—*Permatron Corp., Dept. HPAC,* 4840 *Linder Ave., Chicago.*

In filter models 1 in. thick or larger, two or more ¼ in. metal-framed filters mounted in steel frame to provide "accumulator chamber." Company also supplies filters of ¼ in. thickness for window type air conditioners. Plastic fabric can be cleaned with water.



Air Diffuser . . .

. . . with Holophane lighting fixture —*Connor Engineering Co., Dept. HPAC, Danbury, Conn.*

Diffuser has two-cone design with sleeve type damper. Units made in 6 to 16 in. neck diam, accommodating 100 to 500 watt bulbs. Capacities 200 to 1500 cfm.

Plastic Pump . . .

. . . with wide corrosive range, developed to withstand temperatures to 260 F—*Vanton Pump & Equipment Corp., Dept. HPAC, 201 Sweetland Ave., Hillside, N. J.*

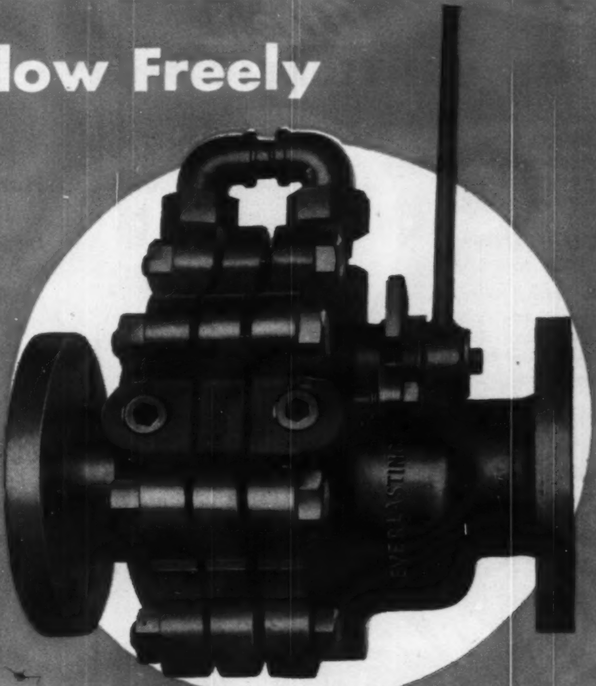
High temperature plastic construction of pump gives close dense molecular structure, resulting in high tensile strength, low permeability, says manufacturer. Pump has wide variety of interchangeable plastic body blocks and rubber or synthetic liners. Liquid is confined to channel formed by outer surface of liner and inner surface of body block; all mechanical and moving parts are out of fluid passage.

Relief Valve . . .

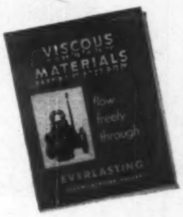
. . . built to meet state codes requiring automatic reseating on temperature relief, pressure relief—*H. A. Thrush & Co., Dept. HPAC, Peru, Ind.*

"No. 170M" valve is available in ¾ in. male inlet, ¾ in. female outlet; "No. 170F" has ¾ in. female inlet, outlet. Temperature actuating element is located at lower end of 6 in. stem, placing element in top of tank where water is hottest. Body and all parts in contact with water are brass or bronze. Both valves have AGA listing of 550,000 Btu maximum input ASME ratings at pressure settings: 75 lb, 450,000 Btu per hr; 100 lb, 575,000 Btu per hr; 125 lb, 700,000 Btu per hr.

VISCOUS MATERIALS
Flow Freely



through
Steam-Jacketed
EVERLASTING Valves



The EVERLASTING Steam-Jacketed Valve has proven outstandingly successful in handling many different kinds of viscous materials, such as tar, asphalt, pitch, paraffin, waxes, molten sulfur, etc.

Available in sizes 1½ in. to 6 in. inclusive, in iron body for 125 psi and cast steel for 150 psi.

For further details, write for Bulletin E-200.

For "everlasting" service, use

EVERLASTING Valves

EVERLASTING VALVE CO.
61 FISK STREET, JERSEY CITY 5, N. J.

EV380

ACCEPTED Allen ROOF VENTILATION

Whatever your ventilating needs, be sure to see how Allen equipment can meet your requirements efficiently and economically.

NEW "I-LINE" for EYE APPEAL

The new "I-Line" provides an attractive low contour, assuring maximum capacity or efficiency with the minimum over-all height.

POWERFUL "VD" for HIGH VELOCITY

By moving a large volume of air at high velocity, this Vertical Discharge fan keeps fumes from sifting back into building.

Allen

. . . is prepared to investigate ventilating problems and plan systems for the efficient removal of heat, fumes, vapor or dust.

WIND-DRIVEN TURBINES

Three types of Allen turbines take full advantage of the economy of natural air movement.

EXHAUST FANS

Remote drive Staxauster is designed to handle corrosive fumes, and/or high temperature air.

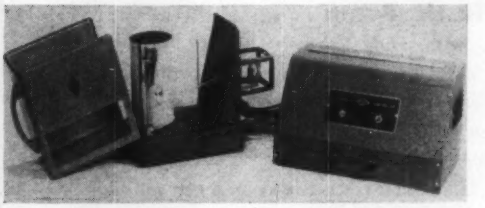
THE ALLEN LINE

Write today for catalog that gives specifications and performance data on these and other units in the Allen ventilator line.

ALLEN

ALLEN COOLER &
VENTILATOR, INC.
ROCHESTER, MICH

Roof Ventilators for Every Commercial and Industrial Need
REPRESENTATIVES IN PRINCIPAL CITIES



Humidity Recorder-Controller . . .

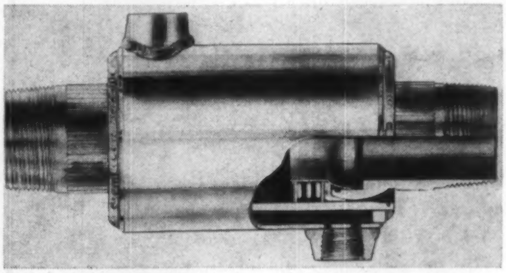
. . . in new two-section, variable-range design—*Serdex, Inc., Dept. HPAC, 12 Bowdoin Sq., Boston 14.*

Accuracy of ± 3 percent RH is obtained by using circular, animal membrane, humidity sensing element, says company. Operating range: 32 to 130 F. Indicator window permits direct reading. Monitoring section of "Type HGS-MHY-1C" is 8 × 8 × 14 in.; sensing section is 12 × 12 × 6 in. Total weight is 24 lb. Unit operates 115 volt, 60 cycle, a-c connection.

Thermal Conductivity Meter . . .

. . . engineered for measurement of *K* factor of insulating materials within temperature range of −120 to 500 F—*Testing Equipment Sales Co., Dept. HPAC, Murray Hill, N. J.*

Apparatus available as complete unit or in components including guarded hot plate assembly, power, control, measuring console, water or mechanically refrigerated temperature bath. Guarded hot plate consists of plate with 6 × 6 in. test areas, 2 in. guard, two cooling plates 15 × 15 in. Thermocouples, guard control, power measurements, heater, guard power leads have plug-in features.



Steam Jacketed Expansion Joint . . .

. . . to be used in handling of tars, asphalt, heavy oils, etc.—*Rotherm Engineering Co., Inc., Dept. HPAC, 7280 W. Devon Ave., Chicago 31.*

Construction of joint: inside bore of piece of steel tubing is honed, chrome plated; ball seats used at each end to allow for piping misalignment; a teflon wedge seals preloaded against ball using stainless steel sleeve, spring; these are inserted into tube, snap ring used; bronze nut is used on each end of casing as tied expansion joint; tube of larger diameter applied over joint casing, welded to close steam chamber; two

❶

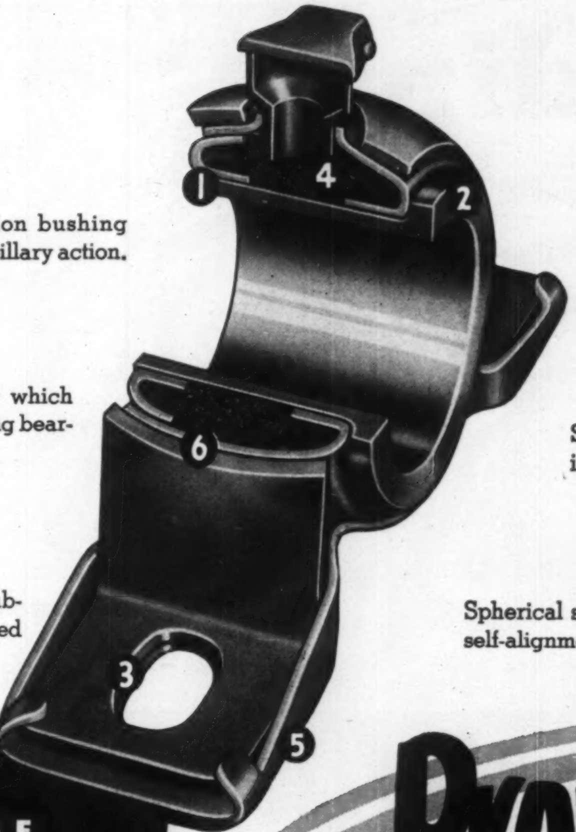
Self-oiling composition bushing feeds oil to shaft by capillary action.

❷

Bushing has shoulder which provides self-lubricating bearing surface for collar.

❸

Slotted Bolt Holes. Rubber grommets can be used for sound isolation.



❹

Absorbent filler holds oil in reservoir and prevents over-lubrication.

❺

Split Pressed Steel Housing is light and strong.

❻

Spherical surfaces provide full self-alignment.

DODGE

Bronzoil

FAN AND BLOWER BEARINGS

Proved

in Millions of installations!

Engineered to meet the specialized requirements of fan and blower service, Dodge Bronzoil bearings are widely and successfully used on small shafts for general service, within the limits of their capacity. Capillary bronze bushing has a capacity of one-third its volume in oil. The liberal oil reservoir, with close fitting wick, surrounding the bushing provides ample lubrication. Millions of Bronzoil bearings have proved their dependability through years of service. Available in shaft sizes from ¾″ to 1¼″. Write now for literature and detailed information.

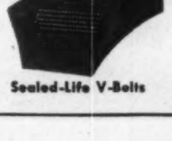
DODGE MANUFACTURING CORPORATION, 1600 Union St., Mishawaka, Ind.

DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look in the *white* pages of your telephone directory for "Dodge Transmissioneer."

Sleevoil Bearings

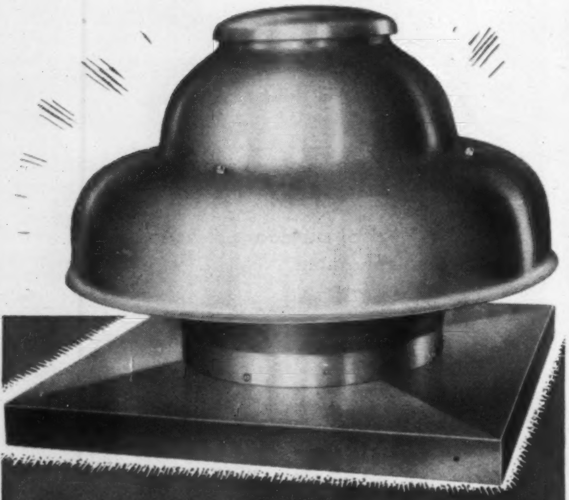
Taper-Lock Sheaves



Sealed-Life V-Belts

Aladdin
AIR HANDLING EQUIPMENT

Type "S" Centrifugal
ROOF VENTILATORS



- CERTIFIED RATINGS
- ALUMINUM HOUSED
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- WEATHERPROOF
- QUIET OPERATION

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PFMA

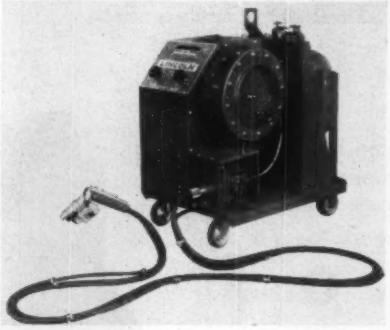
ALADDIN Type "S" Roof Ventilators feature an attractive Spun Aluminum Housing of low contour. Designed especially for those installations which require a small powered exhaust unit. The Type "S" Roof Ventilator is ideally suited for schools, hospitals and similar type buildings.

Seldom requiring maintenance, these units are furnished with unusually quiet, fan cooled motors with outstanding lubricating systems, assuring long, continuous service under severe conditions of dust and dirt.

Write for complete data

ALADDIN HEATING CORPORATION
1111 WEST AVENUE 137 • SAN LEANDRO, CALIFORNIA
A6-58

fittings welded to outside of casing for steam inlet, condensate outlet. Joints capable of handling 500 F temperature. Ball sections can be used as union in installing line. Length of axial travel controlled by using proper tube length.



Arc Welding Machine . . .

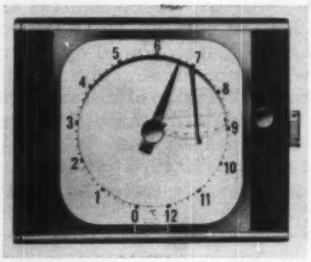
. . . for submerged arc process—*Lincoln Electric Co., Dept. HPAC,* 22801 *St. Clair Ave., Cleveland* 17.

"Lincolnweld ML-3" provides automatic wire feed, flux flow, travel speed, but permits manual guiding of welding arc. With automatic travel speed, operators use to 600 amp for speeds to 70 in. per min. Unit operates from variable voltage, motor-generator set or rectifier with capacity to supply 400-600 amp d-c. A separate 115 volt a-c source required for control circuits.

Motorized Psychrometer . . .

. . . for heating, air conditioning applications—*E. Vernon Hill & Co., Dept. HPAC, P. O. Box* 189, *Lake Geneva, Wis.*

Six volt battery powered, motorized psychrometer operates over range zero to 120 F and 30 to 110 F. Gives steady aspiration over wet and dry bulb in excess of 20 fps. Height 13½ in.; width 5½ in.; weight 3½ lb.



Indicating Potentiometers . . .

. . . designed for use when legibility of indicating scale from distance is factor—*Bristol Co., Dept. HPAC, P.O. Box* 1790, *Waterbury, Conn.*

Instrument has same 32 in. scale, same pointer as

READING TUBE
SHIRT SLEEVE SERVICE
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COPPER BRASS
TUBE
And RED BRASS PIPE

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Why do users of READING COPPER TUBE

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Contractors who have ordered Reading Copper Tube recognize its quality as second to none. But they also know that their Reading Distributors get personalized "Shirt-Sleeve Service" from Reading and pass that service along with Reading products.

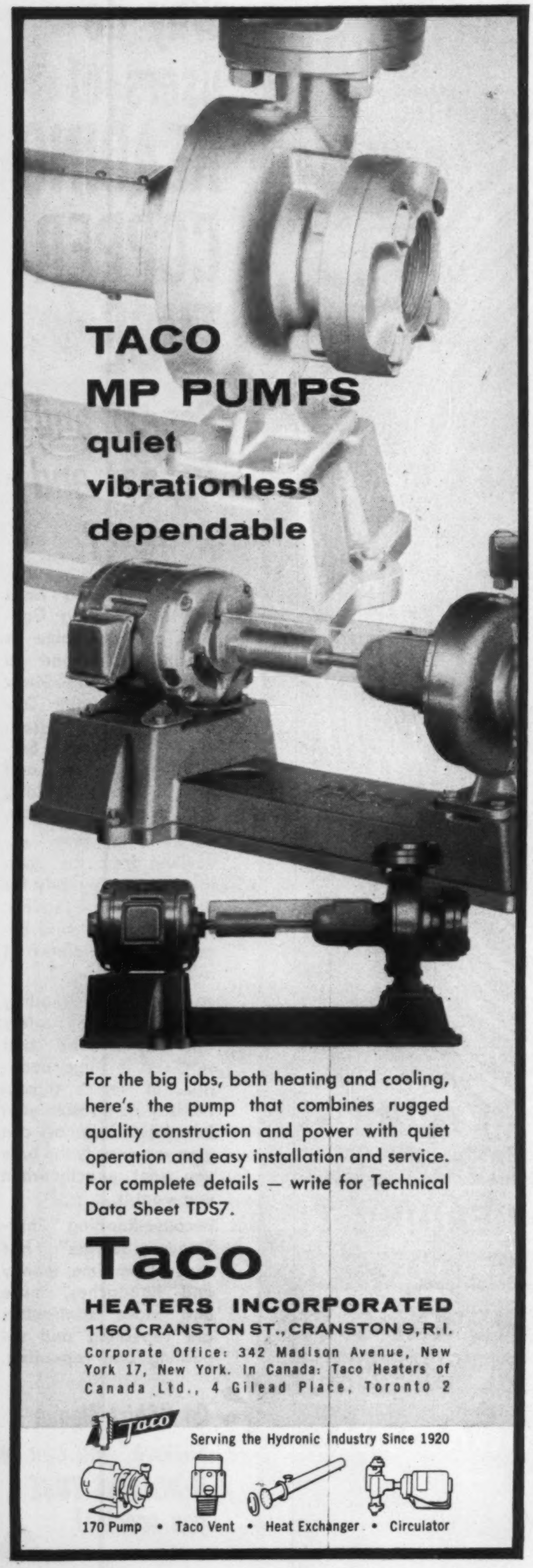
At Reading, every executive, from the president down, is ready for any emergency request. Red tape is cut and bypassing thru clerks is avoided.

As *specialists,* Reading makes a wide variety of copper tube and stocks it in huge quantities in depots thruout the U.S. As a result, your Reading Distributors can give you exactly the tube you want, exactly when you want it.

Because Reading "Shirt-Sleeve Service" has saved them time, money and headaches, more and more contractors are repeating and repeating and repeating.

* *On "Shirt-Sleeve Service" you can rely, if READING TUBE you specify!*

MADE IN U.S.A.
TO THE STANDARDS
OF AMERICAN INDUSTRY


TACO
MP PUMPS
quiet
vibrationless
dependable

For the big jobs, both heating and cooling, here's the pump that combines rugged quality construction and power with quiet operation and easy installation and service. For complete details — write for Technical Data Sheet TDS7.

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HEATERS INCORPORATED
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Corporate Office: 342 Madison Avenue, New York 17, New York. In Canada: Taco Heaters of Canada Ltd., 4 Gilead Place, Toronto 2

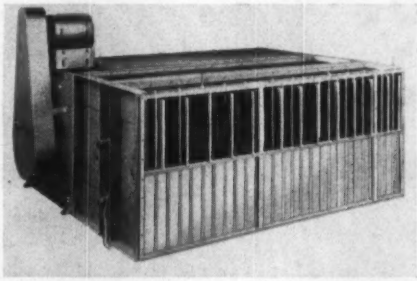
Serving the Hydronic Industry Since 1920

170 Pump • Taco Vent • Heat Exchanger • Circulator

EQUIPMENT DEVELOPMENTS

Continued

standard round chart recording "Dynamaster," also mounted in standard case. No recording mechanism; instrument indicates only. Potentiometer or bridge also offered in electric control models, in on-off, two-position, three-position, floating, proportional, current-input types of control.



Heating and Ventilating Units . . .

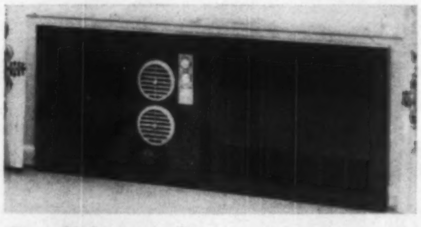
. . .redesigned to provide broader capacity coverage—*American Blower, Div. of American-Standard, Dept. HPAC, Detroit* 32.

Company's new line of units offers 11 sizes for requirements 600 to 66,000 cfm (300 to 1200 fpm coil face velocity). Also utilizes flexible sectional construction design, permitting wide selection of combinations and arrangements, says company.

Temperature Indicating Crayons . . .

. . . for instantly detecting faulty steam trap, without disconnecting trap—*Tempil Corp., Dept. HPAC,* 132 *W. 22nd St., New York* 11.

In 100 lb steam system, temperature of steam is 338 F above trap, 298 F below trap. "Tempilstik" for 300 F makes chalky mark on return line, if trap is functioning correctly. If not, live supply steam blows through so temperature above and below trap is 338 F — and 300 F crayon leaves melted mark on return line below trap.



Air Conditioner-Convector . . .

. . .in single cabinet combination—*Embassy Steel Products, Inc., Dept. HPAC,* 890 *Stanley Ave., Brooklyn* 8.

"Weather-Twins" unit combines Kelvinator air conditioner and Embassy convector heating system. Air conditioner is air cooled. Convector elements are adaptable for one-pipe steam, two-pipe vacuum and hot water systems.

Kathabar® systems deliver air continuously at dry bulbs and dew points down to minus 90 F

You know how much money you could save your company if you could get a continuous supply of air at conditions anywhere below 32 F dry bulb and dew point. You also know how free you could be if you didn't have to worry about frost, coolant temperature, and any other obstacles to low-temperature operation.

These profits are immediately available to you in a Kathabar-engineered air conditioning system. Specify any sub-freezing air conditions you require, and Kathabar engineers will meet your specs with a system which is economical, continuous, automatic, and simple.

sample conditions

The conditions you want may be in this group of Kathabar-engineered installations:

PROCESS	AIR OFF *dry bulb*	KATHABAR *dew point*
Ordnance testing	-90 F	-100 F
Wind tunnel	-47 F	-61 F
Candy bar chilling	0 F	-19 F
Photo film chilling	6.5 F	2 F
Glass laminating	23 F	-2 F
Brewing	28 F	10 F
Chemical processing	24 F	5 F

These samples merely hint at the versatility of Kathabar systems. They will give you dew points as low as minus 90 F under pressure or vacuum, if you want them.

pay-off points

To you, the possibility of a continuous process at sub-freezing air temperatures might be the greatest advantage of a Kathabar system. To someone else, its precise control of dry bulb and dew point is the chief attraction. Others say they gain most from Kathabar engineers' knowledge of materials and processes.

All Kathabar low-temperature applications have clear advantages in common. They tremendously increase cooling efficiency by eliminating frost. This prevents refrigeration freeze-ups, avoids cyclic operation, and often gives better cooling with less tonnage.

They eliminate defrosting shutdowns and the need for duplicate coils.

With "Kathene" solution, the most potent chemical absorbent known, a 10 F to 25 F dew point depression may be obtained between the outlet air dew point and the cooling medium temperature. There is no need to cool the air or the absorbent to the desired dew point temperature. There is exact control of dew points without vaporization or "carryover." Regeneration of the absorbent is automatic and continuous.

Operation and maintenance are simple and economical. In many cases, Kathabar systems can be adapted to existing air conditioning systems.

who uses Kathabar systems

Kathabar systems make profits out of air for these industries:

Atomic Energy
Breweries
Cake Mix
Candy
Cellophane
Cellulose
Cereals
Chemicals
Coffee
Comfort
Compressors
Cookies
Electronics
Explosives
Film
Foundries
Gelatin
Glass
Glue
Gum
Hospitals
Hotels
Lacquer
Lenses
Machining
Marine
Matches
Meat
Offices
Ordnance
Paper
Pharmaceuticals
Plastics
Printing
Rockets
Rubber
Sanitaryware
Shellac
Sugar
Testing
Textiles
Transformers
Transistors
Vacuum Tubes
Varnish
Waterworks
Wire
Yeast

how they use Kathabar systems

Many of these industries use Kathabar systems for obtaining continuous air at sub-freezing dry bulbs and dew points. Others use them to (1) maintain spaces below 80 F and 55% RH; (2) maintain spaces at specific low bacteria or mold count; (3) eliminate wet floors, walls, equipment; and (4) improve drying processes.

Write for additional information; you'll get it by return mail.

send description of your problem

Air Conditioning and Drying Division
SURFACE COMBUSTION CORPORATION
2384 Dorr Street Todelo 1, Ohio

Kathabar systems by Surface

HOW TO ISOLATE VIBRATION IN AIR CONDITIONING SYSTEMS

Here are eight practical solutions to your vibration problems

FOR ALL-PURPOSE USE

These rubber-in-shear vibration mountings are widely used for isolating vibration and noise on air conditioning equipment. Shipped complete, ready to use, their rated load is from 40 to 4000 lbs. Catalog RS-55.

FOR PUMPS COMPRESSORS, FAN-MOTOR SETS

Floating Rail vibration mountings have rubber-in-shear isolators. Rails are tapped and drilled to specification. Bases made for fan-motor sets are shipped complete, ready for installation. Catalog FR-55.

FOR SUSPENDED EQUIPMENT AND PIPING SYSTEMS

Two types of vibration hangers are available: rubber-in-shear (load range: 35 to 1500 lbs.), and steel spring (50 to 1400 lbs.). Both are extremely effective in preventing transmission of vibration from suspended equipment and piping systems. Catalog VH-55.

FOR WATER LINES

The original SOUNDZORBER. Wire-reinforced, wrapped-fabric, rubber pipe widely used for reduction of water line noise and vibration. Working pressures up to 250 psi. Sizes: ½ to 14" ID with I.P.T. male fittings or with full-faced rubber flanges backed up with Series 15 or 30 steel flanges. Catalog SZ-55.

FOR MASSIVE DIFFICULT-TO-ISOLATE EQUIPMENT

ISOLANT is an unusually strong and resilient material which provides excellent isolation of vibration, shock and noise. It is particularly suited for massive air conditioning equipment and similar machinery. Load range: up to 6000 lb. per sq. ft. Catalog IS-55.

FOR HEAVY EQUIPMENT

Steel Spring vibration mountings offer maximum vibration, shock and noise isolation of difficult-to-isolate low-speed machinery, heavy air conditioning equipment, and delicate instruments. Load range: from 100 to 6500 lbs. Catalog SS-55.

FOR FREON LINES

. . . a seamless flexible bronze tubing covered with woven wire braiding, is used to minimize vibration and noise in air conditioning and refrigeration freon lines. Standard copper tube female "slip fittings," welded on both ends, are available from ⅛" to 8" ID. Catalog FZ-55.

FOR STEAM AIR AND GAS LINES

. . . a stainless steel, welded-diaphragm-type, packless expansion joint used for control of vibration, expansion and contraction in steam, chemical, oil and gas lines. Working pressure from vacuum to 1000 psi at −300 to +1800F. Sizes: ½" to 24" with steel flange or weld end fittings. Catalog EZ-55.

For complete catalog information, write—

FINN

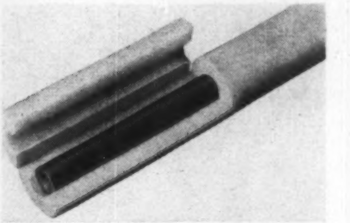
T. R. Finn & Company, Inc., Industrial Division
200 Central Avenue, Hawthorne, New Jersey

VIBRATION FINNFLEX CONTROL

REPRESENTATIVES wanted. If interested write or call, describing qualifications.

EQUIPMENT DEVELOPMENTS

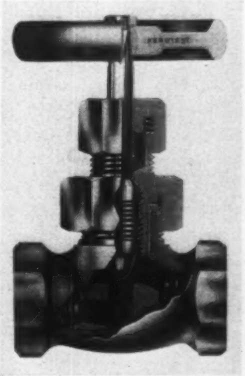
Continued



Pipe Insulation . . .

. . . formulated to cut application time—*Glo-Brite Products, Inc., Dept. HPAC, 6415 N. California Ave., Chicago* 45.

Low temperature pipe covering with pre-adhesive edges available in range of diameters for large and small piping, provides insulation, vapor barrier, anti-sweat, anti-drip properties. Rotproof, moldproof, waterproof, odorless, requires no covering or bands, say company.



Needle Valve . . .

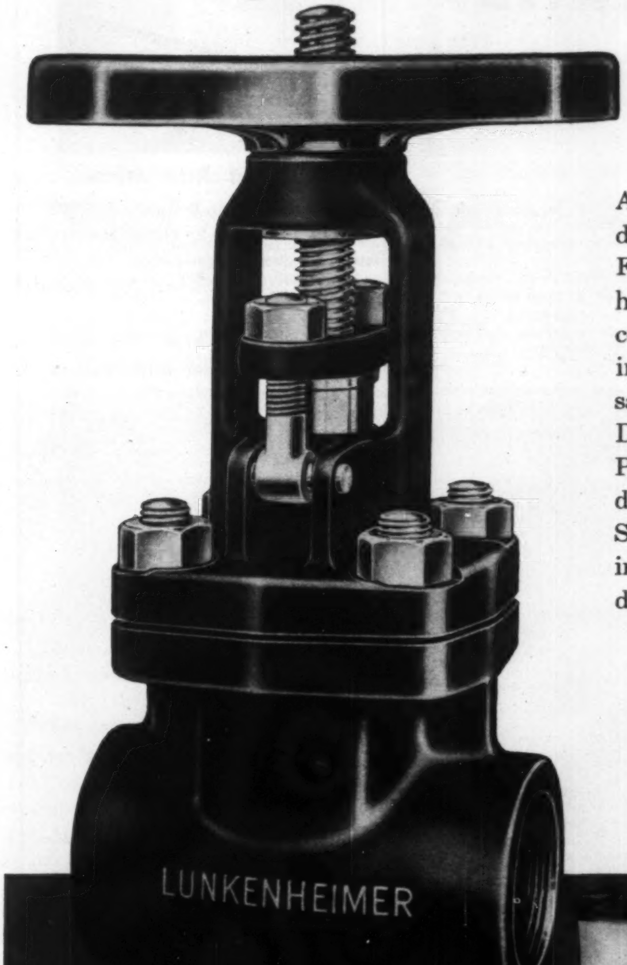
. . . designed for high pressure service — *Kerotest Mfg. Co., Dept. HPAC, 2525 Liberty Ave., Pittsburgh* 22.

Model "N-20" valve intended for throttling, regulating, or shutoff operation in industrial service, utilities, chemical plants, others. Features cited: newly designed forged carbon steel body, backseating construction permitting repacking while under pressure, heat treated stainless steel stem operating in a sleeve yoke. Maximum working pressure 10,000 psi at 70 F; maximum operating temperature 500 F. Special packing furnished for higher temperature ratings.

NOW! AN ALL-NEW

Forged Steel Gate Valve

by LUNKENHEIMER



Another addition to the world famous line. In design, materials, and workmanship, this new Forged Steel Valve offers traditional Lunkenheimer performance to cut your maintenance costs to rock bottom. It's compact to fit cramped installation areas, without excess weight—yet safely handles high pressures and temperatures. Discs are 500 Brinell 13 Chrome Stainless Steel. Precision machined guides keep the disc from dragging across seat rings. Hardened 13 Chrome Stainless seat rings are rolled-in—never loosen in service. A two-piece gland of ball-and-socket design prevents binding in stuffing box.

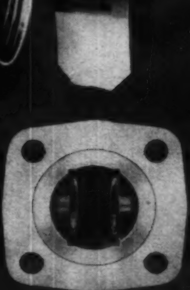
See your Lunkenheimer Distributor, or write The Lunkenheimer Company, Cincinnati 14, Ohio, for literature.

LUNKENHEIMER
L
QUALITY ®

Fig. 8001

OUTSIDE SCREW AND YOKE—BOLTED BONNET

800 lbs. 850 F—2000 lbs. 100 F
Fig. 8001—Screw Ends, Sizes ½"—2"
Fig. 8002—Socket Welding, Sizes ½"—2".

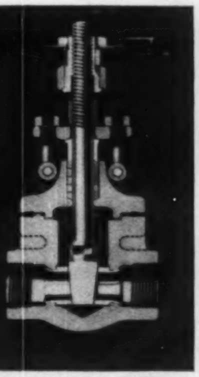


KEYED HANDWHEEL

A strong torque transmitting connection to yoke bushing is provided by a handwheel key. All parts easily dismantled and reassembled. Handwheel nut securely locked in place.

UNIFORM SEAT-DISC HARDNESS

Discs are 500 Brinell—not just on wearing surfaces but all the way through. Uniform hardness eliminates danger of chipping or cracking in service. Seat Rings are also hardened.



L 487 14

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installation costs

Air Conditioning contractors know the importance of compact design in pumps for air conditioning service. That's why Ingersoll-Rand Motorpumps are being specified more and more for all types of installations.

I-R Motorpumps operate efficiently in any position. They are easily bolted to floor, wall or other equipment, and need no special foundation.

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11 Broadway, New York 4, N.Y.

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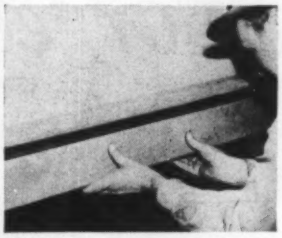
9-818

EQUIPMENT DEVELOPMENTS

Continued



Baseboard Radiation . . .

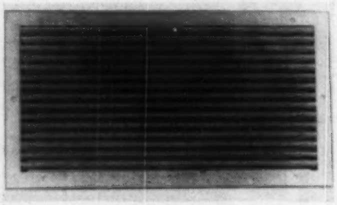
. . . with snap-on fittings, accessories, design intended to eliminate drilling and screws—*Patco Mfg. Co., Dept. HPAC, 231 N. Bread St., Philadelphia 6.*

Unit is 7 in. high, $2\frac{1}{2}$ in. deep, intended for either flush wall or recessed installations. Baseboard contains copper tubed, aluminum finned heating element. Snap-fit bracket keeps top of baseboard from being bent out of position, says company. Supplied in prime coat.

Oil Burner . . .

. . . designed for use as original equipment, replacement in commercial buildings—*Wayne Home Equipment Co., Inc., Dept. HPAC, 801 Glasgow Ave., Fort Wayne, Ind.*

"Model F" is furnished for ratings from 3 to 7 gph, has cast aluminum fan housing, hinged swing away transformer, twin nozzles, oversized air inlet apertures. Electronic controls installed when required.



Return Air Grille . . .

. . . featuring fixed blades with newly designed curved hemmed edges—*Waterloo Register Co., Inc., Dept. HPAC, P. O. Box 72, Waterloo, Iowa.*

Curved design is said to result in nearly sightproof grilles, without decreasing area for free air passage. Hemmed edge strengthens blade, eliminates sharp edge of previous designs, according to manufacturer.

Cleveland's "Modern as Tomorrow"

ILLUMINATING BUILDING

uses Youngstown Steel Pipe

Building Owner: 55 Public Square, Inc., New York, N Y.
(A Vincent Astor-Brooks, Harvey & Company enterprise)
Rental and Managing Agents Ostendorf-Morris Company, Cleveland, Ohio
Architect: Carson & Lundin, New York, N Y
General Contractor George A. Fuller Company, New York, N. Y.
Structural & Mechanical Engineers: McGeorge Hargett & Associates
Consulting Mechanical Engineers: Jaros, Baum & Bolles
Heating & Air Conditioning Contractor: The Feldman Bros. Company, Cleveland, Ohio
Distributor: Grinnell Company, Cleveland

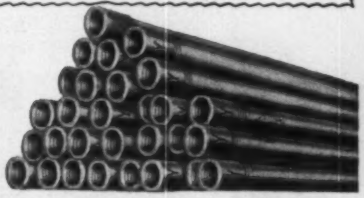
Cleveland's newest architectural beauty — this modernistic 22-story Illuminating Building — will provide much-needed air-conditioned office space for the "Best Location in the Nation". Owner of the new structure, 55 Public Square, Inc., and the architects, wisely chose Youngstown Steel Pipe to provide for a long-lived, dependable water supply system.

Youngstown Steel Pipe is the best pipe obtainable—anywhere. That's because it's made from our highest quality steel by men who have devoted their lives to the pipemaking business. Each and every step in Youngstown's completely integrated operations is closely quality-controlled by expert metallurgists to guarantee pipe that will meet your most exacting specifications.

Your nearby Youngstown Pipe Distributor has complete and ample stocks in all sizes. Why not call him today and discuss your requirements?

Specify Youngstown and secure these
7 Points of uniform goodness

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness



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Manufacturers of
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You'll profit more with the Cleaver-Brooks Progress boiler because it simplifies your planning, purchase and installation. No scatter-buying or boiler-building on the job. You can save up to 2 days' time by installing Progress, a complete, integrated, factory-tested package — ready for you to hook up to service lines. A Cleaver-Brooks representative starts the boiler, trains the attendant. Outstanding Progress features: Four-pass, forced-draft design; electronic controls; soft-flame start; clean-burning, quiet operation; guaranteed 80% efficiency — assure you customer satisfaction.

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City .... Zone .... State ....

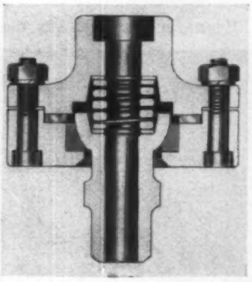
EQUIPMENT DEVELOPMENTS

Continued

Portable Pumping Unit . . .

. . . mounted upon packaged pumping system—*Eco Engineering Co., Dept. HPAC,* 12 *New York Ave., Newark* 1, *N. J.*

Furnished with ¾ in. bronze pump, unit equipped with phenolic or neoprene impellers, carbon bearings, split Teflon asbestos packing rings. Driven by 1/3 hp heavy duty motor, pump has capacity to 10 gpm, pressures to 75 psi. Weighs 55 lb., measures 24 in. long, 17 in. deep.



Swivel Joints . . .

. . . developed to provide points in pipe hookups to make piping movable or flexible — *Barco Mfg. Co., Dept. HPAC,* 500 *N. Hough St., Barrington, Ill.*

"Series 750 Type S" swivel joint withstands steam pressures to 750 psi, temperatures to 750 F with compression installed "11CAS" gasket. Sizes 1 and 1¼ in., with screwed or welding ends, are available from stock. Other sizes available to order.

Solenoid Valves . . .

. . . in nine sizes from ⅜ to 3 in.—*J. D. Gould Co., Dept. HPAC,* 4707 *Massachusetts Ave., Indianapolis* 18.

Standard "Type M" features

Inside typical plenum at IBM, showing Conomatic Air Filters

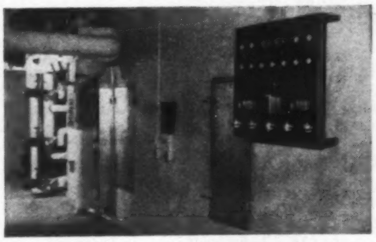
CONOMATIC
CONOMATIC

Close-up of instrument panel and open plenum hatch affords glimpse of double Conomatic filter.

CONTINENTAL *clears the air...*

in huge, new Kentucky plant of

INTERNATIONAL BUSINESS MACHINES CORPORATION



Exterior view of one of the 17 similar complete air-conditioning units in the IBM plant equipped with Conomatic roll-away automatic air filters to supply 933,600 CFM. Gauges and controls to maintain fully automatic operation are mounted on an instrument panel outside each plenum. In addition, a centrally located push-button check panel facilitates instantaneous check on performance of all units throughout the building.

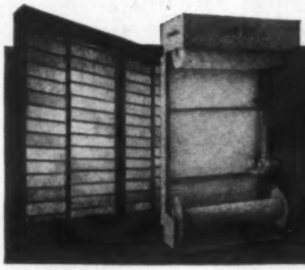
Architects:	Fordyce and Hamby, New York City
Engineers:	Guy B. Panero Engineers, New York City
General Contractor:	Gilbane Building Company, Providence, Rhode Island
HVAC Contractors:	Griffin and Company, Louisville, Kentucky Ward Engineering Company, Louisville, Kentucky

With a minimum of attention, Continental's Conomatic Air Filters clear the air for more than ½-million square feet of manufacturing space in IBM's ultra-modern, fully air-conditioned, one-floor plant in Lexington, Kentucky.

With the major portion of the plant already operating while further units, including the handsome two-story administration building, continue under construction, the dust load has been exceptionally heavy. Yet, filter performance has been trouble-free and the length of life of the replaceable media blankets has been most satisfactory and economical.

Long-run economy and freedom from maintenance are engineered into all Continental Air Filters. They can save you important servicing and operating costs. Let us talk over *your* air filtration needs. Clear the air with Continental.

CONTACT YOUR LOCAL REPRESENTATIVE, OR



CONTINENTAL FILTERS

P. O. BOX 1647 LOUISVILLE 1, KY.

CONTINENTAL
AIR FILTERS Inc.

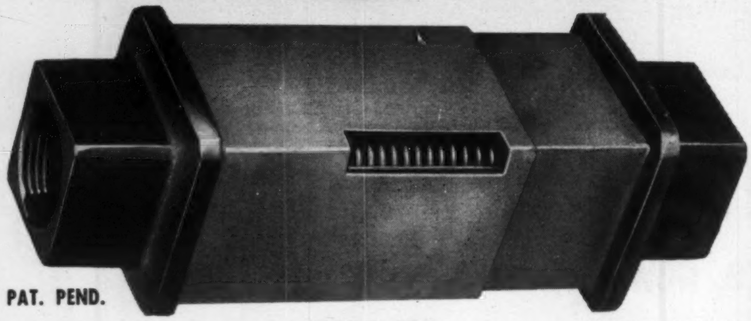
Keflex

QUADRA-SIDE

Telescopic Expansion Compensators

WITH LAMINATED STAINLESS STEEL BELLOWS, 2 PLY OR MORE

. . *something new for the* ARCHITECT — ENGINEER — CONTRACTOR



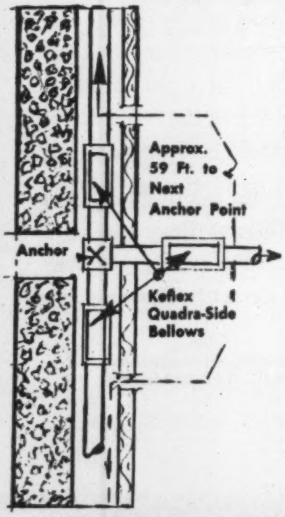
PAT. PEND.

TYPE 7Q

SIZES ¾"-3" Inc.

Working Pressure 300 P.S.I. — Temperature to 800°F. — Has Reserve Strength — Not Just Borderline Prospect of Withstanding Effect of Pressure — Shock — Thermal Line Expansion — High Temperature — Moderate Vibration. HIDDEN PROTECTION PLUS! All Non Corrosive Stainless Steel Bellows With Brass or Bronze End Fittings and Telescopic Shrouds.

KEFLEX FITS IN NARROWEST WALL SPACE—SAFE—PERMANENT


Approx. 59 Ft. to Next Anchor Point
Anchor
Keflex Quadra-Side Bellows

● **ROUND** KEFLEX Bellows are made of Laminated Stainless Steel, multiple ply (usually 2 ply or more) for greater strength with minimum force required to move bellows. The minimum force to move 7 Q Keflex Bellows greatly reduces the need for additional anchoring above that required to handle line pressure thrust force as the force to move Keflex 7 Q only is always less than 100 lbs.

● **FLAT** KEFLEX FLAT GUIDES offer so many advantages it is difficult to mention them all. Briefly: The KEFLEX FLAT OUTSIDE GUIDE (shroud) is made of brass USUALLY formed square of required length —one unit end will telescope over other unit end. The flat surfaces slide over and in one another—practically eliminating possibility of torque as result of faulty installation. This ASSISTS PROPER GUIDING.

● **SQUARE** KEFLEX SQUARE END FITTINGS are made of heavy, non-porous, square, bronze stock, and threaded tapered female pipe size. They are attached to the KEFLEX 7 Q bellows and the outside guides by silver brazing. The result is an easy moving expansion joint that will absorb either the slightest or the greatest thermal pipe expansion and with practically no load on the anchors. The heavy bronze ends, which will not crush during normal installations, assures safe and leakproof joints.

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U. S. FLEXIBLE METALLIC TUBING CO.

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KEFLEX MANUFACTURING DIVISION

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63 MAIN ST.

PORTLAND 9, OREGON
328 N.W. BROADWAY

SEATTLE 4, WASHINGTON
2425—6TH AVE. S.

EQUIPMENT DEVELOPMENTS

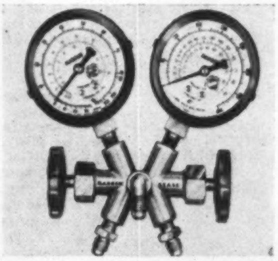
Continued

cited: molded epoxy resin waterproof coils; unbreakable piston rings; guided pilot valve seats. Valves are packless, two-way, piston pilot operated, designed for pressures to 400 psi and temperatures to 340 F.

Solenoid Valve . . .

. . . designed to have no metal contact with fluid — *Valcor Engineering Corp., Dept. HPAC, Kenilworth, N. J.*

"SV-5100" is 115 volt, a-c, 60 cycle unit with maximum current drain of 10 watts. Made of molded synthetic fabric with plastic diaphragm seal, it may be taken apart for cleaning, inspection without removing it from lines. Standard models equipped with 24 in. pigtail leads. Molded coils, conduit connections, lead length variations available.



Charging, Testing Unit . . .

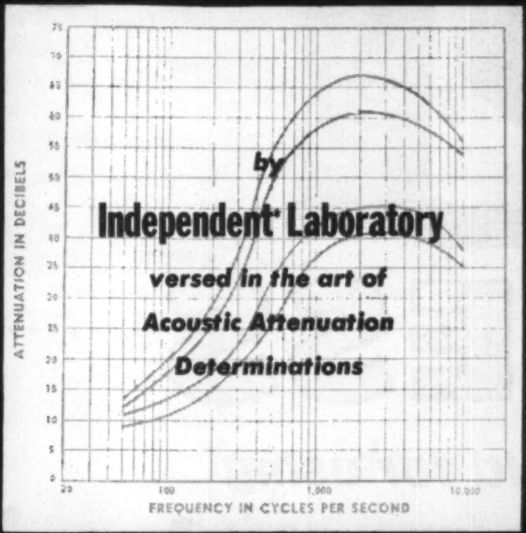
. . . designed for testing and purging both high and low sides—*Madden Brass Products Co., Dept. HPAC, P. O. Box 444, Aurora, Ill.*

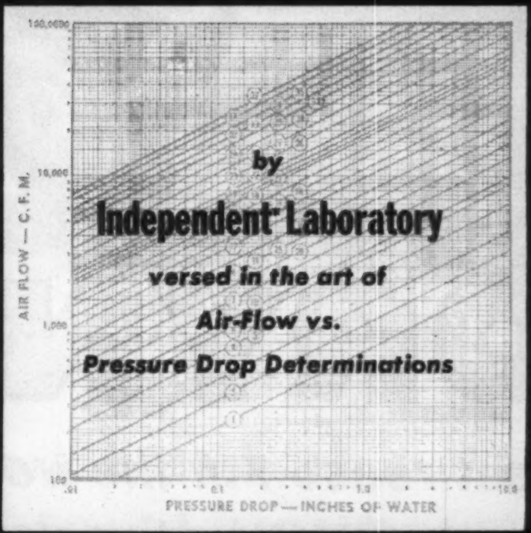
Features cited: plastic valve seat; requires only light hand pressure for shutoff. This double gage refrigeration charging, testing unit also includes plastic packing gland.

Quiet-DUCT Silencers

PROVED BEST BY TEST!

Performance Verified by Recognized Independent Laboratories!

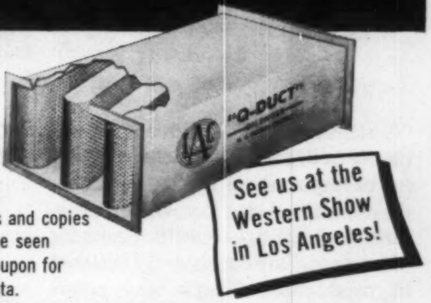




*"Independent" should mean "without any vested interest" in any patents, or assignments of patents, or any royalty agreements for such devices.

*"Recognized" should mean acknowledged or skilled in a specific field.

You can be sure of getting the results you want when you specify Quiet-DUCT Silencers!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SUPER-DRY REFRIGERANTS

"Genetron" Refrigerants are the ultimate in dryness. In "Genetron" 12, for example, there is less than one-thousandth of one percent of moisture! And the tight specifications for "Genetrons" are consistently *bettered* in production. That's why smart service engineers everywhere are insisting on Super-Dry "Genetrons."

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QUICK FACTS on GENETRON Super-Dry Refrigerants

- Guaranteed exceptionally low moisture content.
- Noncorrosive to standard equipment materials, nontoxic, nonflammable, stable, safe.
- Critical and freezing points well outside range of operating uses.
- Solvent action on oil helps prevent solidification or congealing of lubricant; aids in lubrication of equipment; generally miscible with oil.
- Freely interchangeable and may be mixed in any proportions with comparable fluorinated hydrocarbons meeting the same strict refrigerant specifications.
- Available everywhere, from refrigeration wholesalers throughout the country.

GENETRON 11 ORANGE LABEL CCl_3F
Trichloromonofluoromethane

GENETRON 12 WHITE LABEL CCl_2F_2
Dichlorodifluoromethane

GENETRON 22 GREEN LABEL $CHClF_2$
Monochlorodifluoromethane

GENETRON 113 PURPLE LABEL $C_2Cl_3F_3$
Trichlorotrifluoroethane

GENETRON 114a BLUE LABEL $C_2Cl_2F_4$
Dichlorotetrafluoroethane

GENERAL CHEMICAL DIVISION
40 Rector Street, New York 6, New York

EQUIPMENT DEVELOPMENTS

Continued

Pipe Joint Seal . . .

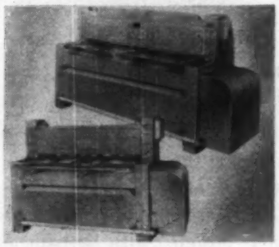
. . . designed to maintain seal at extreme temperatures and pressures—*Aeroquip Corp., Dept. HPAC, 300 S. East Ave., Jackson, Mich.*

"Conoseal Tubing Joint" retains seal from −300 to 1800 F, and rated capacity exceeds burst pressure of pipe used, says manufacturer. Seal requires two bolts to put together, take apart. Available in three different operation performance ranges.

Acid Regeneration . . .

. . . developed to increase acid regenerant concentration to cation of demineralizers at prescribed rates in infinite number of steps—*Graver Water Conditioning Co., Div. of Graver Tank & Mfg. Co., Inc., Dept. HPAC, 216 W. 14th St., New York.*

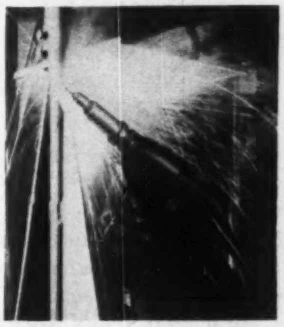
Major controls for system consist of transmitter to measure acid flow, control valve to control flow, flow controller to control valve and program regulator cam to operate variation of flow.



Power Shears . . .

. . . developed to provide continuous power operation in industrial production at full rated capacity—*Peck, Stow & Wilcox Co., Dept. HPAC, Center St., Southington, Conn.*

Ten gage, power squaring shears are available in models of 4 ft and 6 ft capacities. Features cited: machine tool grade castings; fixed beam channel holddown; safety square pin clutch; single or repeat stroke (62 per min.); four-edge blades; built-in blade clearance; full length bed T-slot; safety characteristics.

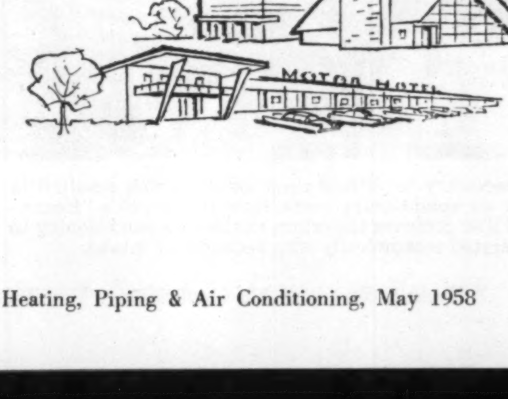


Inert Gas Arc Welding . . .

. . . with manual unit developed to handle broad range of wire types, sizes—*Air Reduction Co., Inc., Dept. HPAC, 150 E. 42nd St., New York.*

Welding assembly consists of gun, fittings, wire feeder, control panel, hoses and cables to carry cooling water and shielding gases. Guns available to cover wire types, sizes 0.020 in. hard to 1/8 in. aluminum. Equipment is portable.

Your ideas work better when you work with HONEYWELL

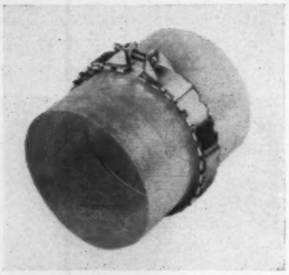


The following pages bring you the latest developments in automatic controls from Honeywell. They widen your choice of products, give you more to work with.

For complete information on these new control products and systems, call your nearest Honeywell sales office. Honeywell provides 112 offices throughout the country; each is staffed with capable control specialists to assist you in preparing proposals and writing specifications.

Look over these new products and systems. And, remember, they are backed by the kind of support only Honeywell can offer you.

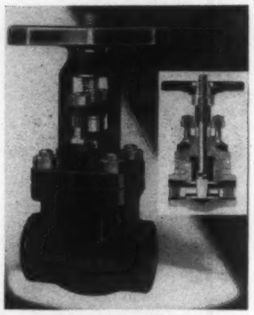
FOR MORE TO WORK WITH . . . WORK WITH HONEYWELL



Duct Coupling . . .

. . .for joints in ventilating, heating, air conditioning systems, other commercial ducting—*Aeroquip Corp., Dept. HPAC, 300 S. East Ave., Jackson, Mich.*

"Marman Ventiduct Flexible Coupling" is constructed of stainless steel, which is nonmagnetic, noncorrosive in moist atmospheres. Features cited: ease of field assembly, installation of duct systems; simplicity of dismantling, reassembly of ducting for periodic inspection; long service life. Segmented coupling strip is available in 3 ft lengths; clips come in pairs.



Steel Gate Valves . . .

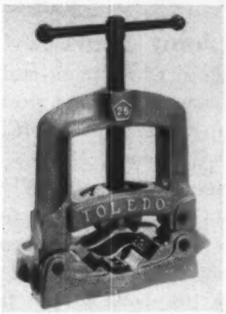
. . .built for installation in cramped quarters—*Lunkenheimer Co., Dept. HPAC, Waverly and Beckman Sts., Cincinnati 14.*

Valves are produced with bolted bonnet design, with outside screw rising stem, solid wedge disc, rolled-in seat rings. Available with screwed or socket welding ends in sizes ½ through 2 in. Rated at 800 lb at 850 F, 2000 lb at 100 F.

Flexible Hose, Tubing . . .

. . .in wide range of sizes, types—*American Metal Hose Div., American Brass Co., Dept. HPAC, 414 Meadow St., Waterbury 20, Conn.*

Manufacturer's line is available in bronze, brass, steel, stainless steel, aluminum, monel, super nickel, other metals. Intended for industrial applications in conveying water, gas, oil, air, chemicals, steam, refrigerants, tar and asphalt, other types of materials.



Pipe Vise . . .

. . .featuring several design improvements over earlier models—*Toledo Pipe Threading Machine Co., Dept. HPAC, 1445 Summitt St., Toledo 4.*

Model "No. 25" has ⅛ to 4½ in. capacity. Features cited: five jaw construction; integral pipe benders; evenly distributed contact points.

FOR MORE TO WORK WITH ... WORK WITH HONEYWELL

In a restaurant application, the Honeywell "Renew-Air" Filter has high absorption capacity for such objectionable odors as tobacco smoke, burning fat, fish and others likely to be present. In the past, increased outdoor air intake was necessary to diffuse these odors, which resulted in higher air conditioning costs. Now Honeywell's "Renew-Air" Filter removes the odors, enables air conditioning to be operated economically with reduced air intake.

EQUIPMENT DEVELOPMENTS

Continued

Tube Cutter Set . . .

. . . consisting of "No. 161" tube cutter, "No. 161-A" extra cutter wheel and "No. 162" flaring tool with compressor attachment — *J. H. Williams & Co., Dept. HPAC,* 400 *Vulcan St., Buffalo* 7.

Set is intended for cutting and flaring work on copper, brass, aluminum tubing 3/16, ¼, 5/16, ⅜, 7/16, ½ ⅝ in. diam. Tube cutter will cut tubing from ⅛ to 1 in. diam. A permanently attached reamer turns to 90 deg angle for reaming operation. Flaring tool consists of drop-forged compressor that slides over die block.

Air and Vacuum Pump . . .

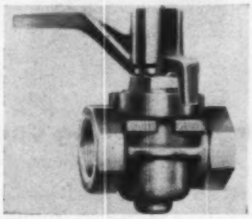
. . . redesigned to incorporate rotary shaft seal to prevent leakage of air into pump—*Leiman Bros., Inc., Dept. HPAC,* 102 *Christie St., Newark* 5, *N. J.*

Use of shaft seal on pump also prevents leakage of medium pumped into atmosphere, permits pump to be used for gas sampling, impinging, instrument controls, food handling, paper feeding and folding, textile processing, similar operations. Volume ranges 2 to 12 cfm with vacuums to 20 in. Hg., or pressures to 15 psig. Pumps may be mounted on bedplates with connections to motor by v-belt drive, or close coupled to motor shaft.

Insulation . . .

. . . of glass fiber for heating, air conditioning applications — *Ehret Mfg. Co., Dept. HPAC, Valley Forge, Pa.*

"Therma-K" insulation is to be produced in three forms: pipe cover, for insulating hot and cold water piping, low pressure steam and refrigerant lines; duct liner, for insulating reducing noise in dual heating, air conditioning ducts; exterior duct and equipment insulation, for covering outside of metal ducts and other heating, cooling equipment. Designed for applications where temperatures range from subzero to 350 F.



Plug Valve . . .

. . . developed to operate on eccentric principle—*DeZurik Corp., Dept. HPAC, Sartell, Minn.*

Eccentric shaped plug, carried on journals at either end, rotates quarter-turn from open to shut. Contact between plug-face and eccentric raised-seat face made only when valve is fully closed, says manufacturer. Made from bronze, semi-steel, aluminum carbon steel, stainless steel, alloys in sizes ½ to 20 in.

For your mechanical systems . . .

Honeywell's "Renew-Air" Filters

reduce size of cooling equipment needed, pay for themselves before installation

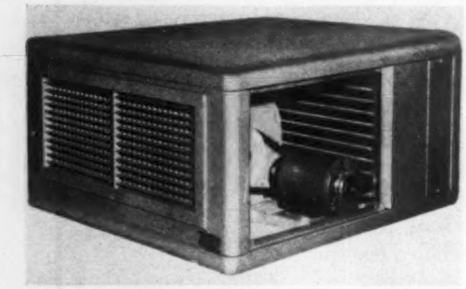
In restaurants, stores, hotels, office buildings, Honeywell "Renew-Air" Filters can save your clients money. By reducing the amount of outdoor air intake normally required to diffuse internal odors, "Renew-Air" Filters enable you to specify smaller cooling equipment, give your clients efficient air conditioning at a lower initial cost. Savings more than pay for the cost of the Honeywell "Renew-Air" Filters themselves. In addition, client's operating costs are lowered.

And, combined with the Honeywell Electronic Air Cleaner, "Renew-Air" Filters are even more efficient. Their activated charcoal lasts and lasts because no oily smoke or film gets through to clog up the charcoal's pores. There's a bonus with the Honeywell Electronic Air Cleaner, too. It reduces cleaning and decorating costs for owners because it removes dirt particles in the air six times more effectively than ordinary filters.

"Renew-Air" Filters are available in four different sizes and types of cells, easily removable from the frame for re-activation. The Honeywell Electronic Air Cleaner is sold in "building block" modules adaptable to any installation. Call your local Honeywell office for more details.

Honeywell

First in Controls



Air Conditioning Unit . . .

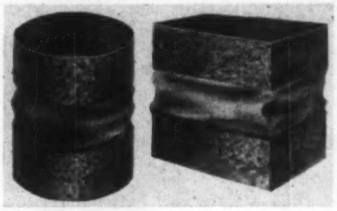
. . . of horizontal blower evaporator type — *Bohn Aluminum & Brass Corp., Dept. HPAC, Danville, Ill.*

"Bohn CH" can be ceiling mounted directly in conditioned space or can be remotely mounted and connected to a duct system. Space for steam or hot water coil permits conversion to year 'round air conditioning and heating unit. Filters removable from either side. Available in duct or grille models. Capacities of 2, 3, 4, 5, 7½ tons also available with 400 cfm per ton.

Pipe Threading Power Drive . . .

. . . designed for heavy duty performance—*Oster Mfg. Co., Dept. HPAC, 1340 E. 289th St., Wickliffe, Ohio.*

Model "100 Portable Power Drive" is smallest threading machine in company's line, weighing 77 lb. Provides ⅛ to 2 in. pipe capacity. With optional drive unit, threads pipe up to 12 in. diam. Unit has "Power-Matic" front chuck complete with replaceable jaw inserts that eliminate need for jaw sharpening. Self-centering rear chuck aligns pipe for sharp threads, supports longer lengths of pipe.



Flexible Duct Connectors . . .

. . . with center strip of canvas, asbestos, or neoprene coated glass fiber—*Cain Mfg. Co., Dept. HPAC,* 1111 *N. Fifth Ave., Birmingham* 4.

Two strips of galvanized metal are joined in center with flexible fabric to make "Pre-Fab-Ric" connecting unit. Metal may be joined by any standard method, while fabric is sewed, stapled, cemented together.

Baseboard Heaters . . .

. . . with heating element of aluminized steel — *Electrovector, Inc., Dept. HPAC,* 475 *Flushing Ave., Brooklyn* 5.

"Dual-Fin" heaters have no top nor bottom, may be

For your mechanical systems

Now, a Honeywell Pneumatic Round Thermostat for every installation, every function!

Now Honeywell offers models of the famous Pneumatic Round Thermostat for every application—summer-winter, day-night, modulating, two-position, and submaster.

All versions provide the accuracy, fast-response and dependability of the Honeywell Pneumatic Round, the only new pneumatic thermostat in the industry. And all models feature the world's most popular round thermostat styling.

Simplified design and a complete line of installation fittings make these thermostats easy to install and maintain. Pleasingly styled, tamper-proof guards are available where needed.

Honeywell

H First in Controls

50
60
70
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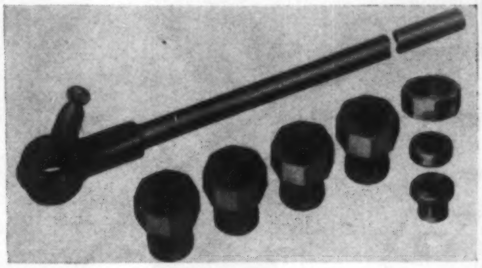
H
Honeywell

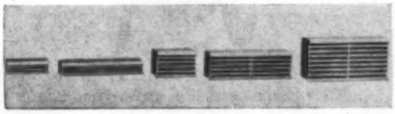
reversed without disassembly. Systems available in 750, 1500, 2000 watts. Dimensions are 2⅞ in. wide, 6½ in. high, lengths of 36, 72, 96 in.



Bolt Die Sets . . .

. . . ranging ¼ through 1 in. — *Nye Tool Co., Dept. HPAC,* 4126 *W. Fullerton Ave., Chicago* 39.

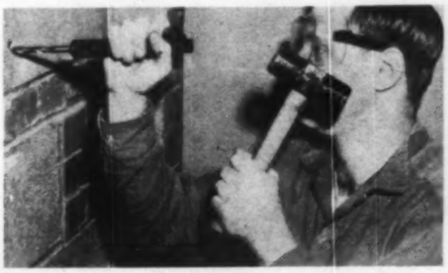
Dies of one piece design; each locked in place by threaded screw cap. For threading short stubs close to wall or ceiling, dies may be quickly reversed.



Brick Size Vents . . .

. . . of cast aluminum, designed for stormproof venting of confined spaces, air conditioning intakes — *Construction Specialties, Inc., Dept. HPAC,* 45 *Winans Ave., Cranford, N. J.*

Five sizes of vents with dimensions corresponding to those of standard brick included. These range one-brick to six-brick size in single, double widths. Six-brick size may be used as modular unit in cinder block as well as brick construction. Two jumbo-brick size vents also supplied, corresponding to one-brick, four-brick jumbo brick size. Vents may be nested together where multiple units are desired.



Multi-Purpose Tool . . .

. . . to be used for hammer-in fastening work, manual drilling—*Ramset Fastening System, Dept. HPAC,* 12117 *Berea Rd., Cleveland* 11.

Tool combines masonry drill holder with "Shure-Set" hammer-in tool. Recommended for use on materials such as concrete, cinder block, mortar, brick, tile.

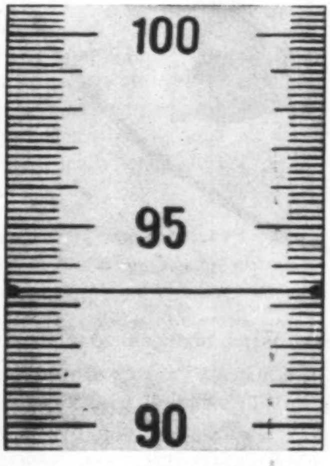
Unlimited remote temperature readings on one Honeywell Electronik* indicator

With this new, compact indicator, the operating engineer can read temperatures at any point in an air conditioning system simply by pressing a button.

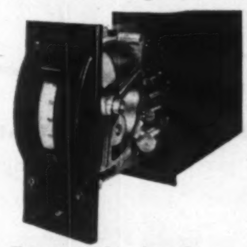
And he gets the most accurate readings known. Honeywell's indicator is accurate to plus or minus 1/5 of a degree because it's electronically precise and its rotating vertical scale—over 28 inches long—gives more than twice the indication area of ordinary circular indicators.

Private offices, zones on each floor, outside air, chilled or hot water lines all can be checked instantly on this one instrument in less than a square foot of panel space. Since sensing elements for the indicator are located right in the thermostat, connected to the indicator by low voltage wiring, there's no need for dual installation.

At little extra cost, a Honeywell Systems Analyzer can be added when desired. Using the same wiring and sensing elements as the indicator, it records, on a 12-inch wide strip chart, the readings for any point or combination of points, provides a permanent record.



Scale shown full size. Twin hairline index prevents parallax errors.



Compact chassis only 6½" wide. Slides out for inspection without stopping operation of indicator.

*Trademark

Honeywell

First in Controls

POWELL

world's largest family of valves

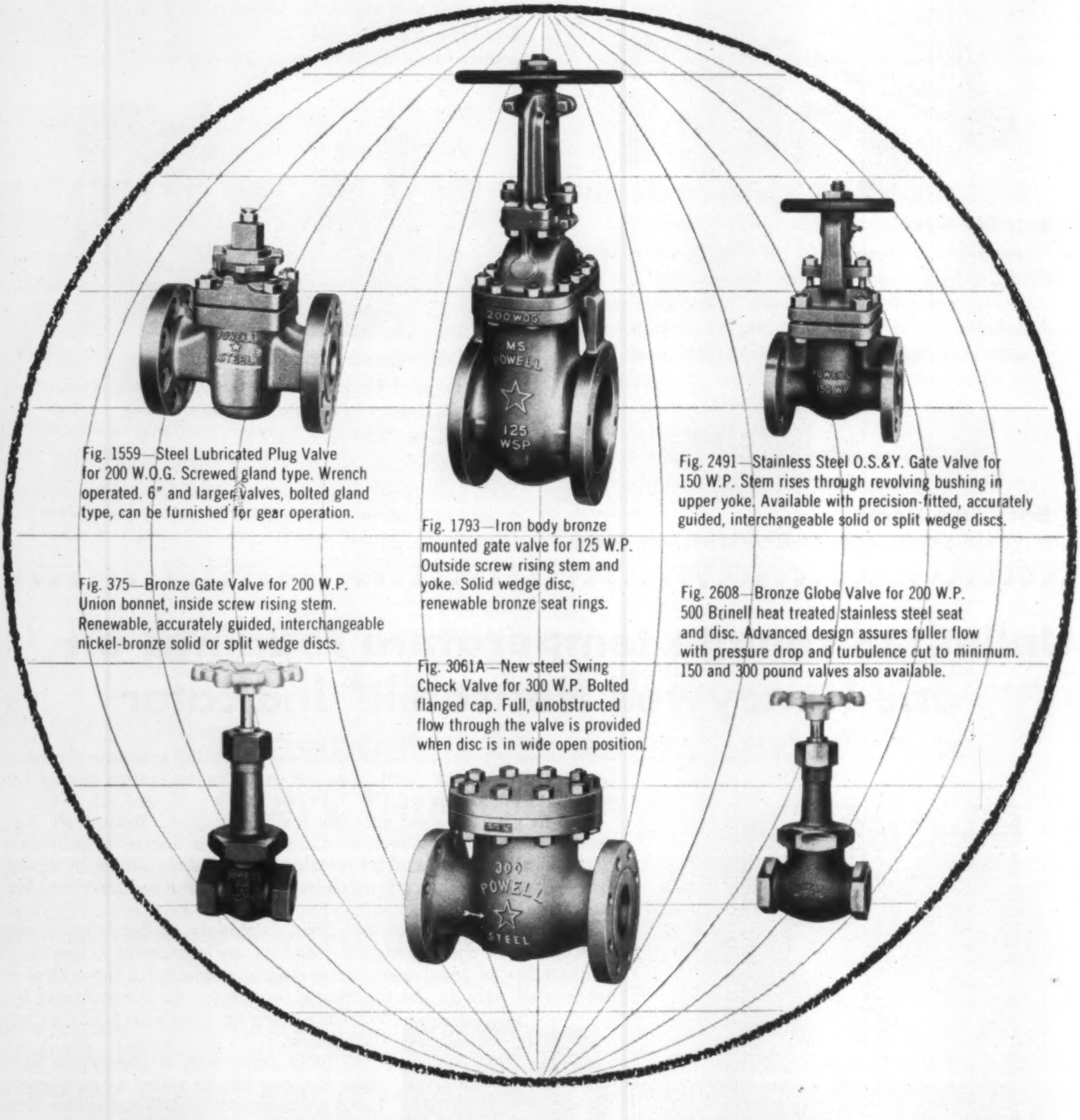


Fig. 1559—Steel Lubricated Plug Valve for 200 W.O.G. Screwed gland type. Wrench operated. 6" and larger valves, bolted gland type, can be furnished for gear operation.

Fig. 1793—Iron body bronze mounted gate valve for 125 W.P. Outside screw rising stem and yoke. Solid wedge disc, renewable bronze seat rings.

Fig. 2491—Stainless Steel O.S.&Y. Gate Valve for 150 W.P. Stem rises through revolving bushing in upper yoke. Available with precision-fitted, accurately guided, interchangeable solid or split wedge discs.

Fig. 375—Bronze Gate Valve for 200 W.P. Union bonnet, inside screw rising stem. Renewable, accurately guided, interchangeable nickel-bronze solid or split wedge discs.

Fig. 3061A—New steel Swing Check Valve for 300 W.P. Bolted flanged cap. Full, unobstructed flow through the valve is provided when disc is in wide open position.

Fig. 2608—Bronze Globe Valve for 200 W.P. 500 Brinell heat treated stainless steel seat and disc. Advanced design assures fuller flow with pressure drop and turbulence cut to minimum. 150 and 300 pound valves also available.

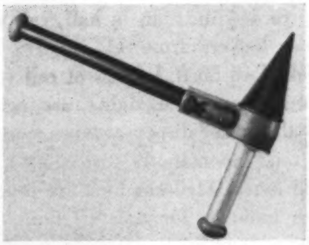
A solution for every kind of flow control problem is as near as your local Powell distributor. Powell valves are designed and engineered in the largest variety of metals and alloys, to handle any medium, every flow control requirement. There are Powell distributors in all principal cities. Or, if yours is a special engineering problem, write to:

THE WM. POWELL COMPANY • *Dependable Valves Since 1846* • **Cincinnati 22, Ohio**

Stud Gun . . .

. . . developed to handle all types of fastening requirements, drive all sizes of pins including 5/16 in.—*Ammo Products, Inc., Dept. HPAC, 1100 20th St., N. W., Washington, D. C.*

Unit uses three interchangeable barrels. Hemispherical safety guard catches dust, particles. Safety devices prevent accidental firing, provide maximum safety for operator, says company.



Pipe Reamer . . .

. . . designed especially for use with small pipe—*Toledo Pipe Threading Machine Co., Dept. HPAC, 1445 Summit St., Toledo 4.*

Ratchet pipe reamer, "Toledo No. 182", has seven flute design intended to improve chip removal, cutting qualities. Has pipe ⅛ to 2 in. Replacement heads available.

Room Air Conditioners . . .

. . . with engineering, design changes—*Mitchell Mfg. Co., Div. Cory Corp., Dept. HPAC, 3200 W. Peterson, Chicago.*

Featured in company's 1958 product line are "True Portable," "Slim 'n Low," "Jubilee" models. New engineering developments include "Floating Air Chamber," "Variable Aire" system, washable "Microstatic"

FLEXON EXPANSION COMPENSATOR
FOR LOW PRESSURE SYSTEMS
MAXIMUM STROKE
MAXIMUM PRESSURE 40 POUNDS
FLEXONICS CORPORATION - MAYWOOD, ILL.

Engineers across the country are specifying

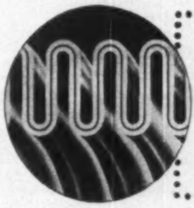
Flexon®

PACKLESS EXPANSION COMPENSATORS

All over the country, for the finest, most modern buildings, you'll find Expansion Compensators written into the heating specifications. Why? Simply because there's no substitute for their completely packless design, their easy installation, and the fact that they *never need maintenance!*

Yes, there's no easier or lower-cost way to take care of pipe and tubing expansion and eliminate water hammer noise, especially in baseboard convector installations. Installed in minutes; you can forget it for the life of the building.

Flexon Packless Expansion Compensators are the modern, low-cost way to absorb pipe motion, proved in thousands of installations. Why not write them into your next job? Write today for the cost data, and the name of your Flexon distributor.



The inside story
2-PLY CONSTRUCTION
The bellows is fabricated from two plies of specially-rolled metal to combine strength with flexibility. Bronze bellows for Model L; stainless steel for Model H.

FLEXON EXPANSION JOINTS
DESIGN GUIDE

Send for the complete Flexon Design Guide
Everything you need to know about absorbing pipe motion, in a concise 28-page design guide.

EC-115

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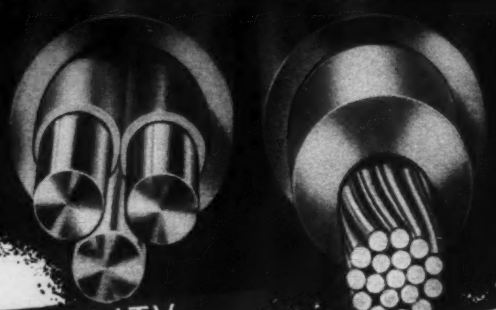
EXPANSION JOINT DIVISION • 1391 S. THIRD AVENUE, MAYWOOD, ILLINOIS
EXPANSION JOINTS · METAL HOSE · NON-METALLIC HOSE · BELLOWS · AIRCRAFT COMPONENTS



Double-barrel solution to all wiring problems!

CHESTER
WIRES & CABLES

QUALITY plus-SERVICE

Longer lasting CHESTER Plasticord-Plasticote wires, and nylon and teflon* insulated conductors, are available in standard or custom constructions for every requirement. All are service-proven for complete reliability for the specific application for which they are engineered. And equally reliable, is the service behind them... from "crash" deliveries to engineering assistance on the design of special purpose constructions!

"Chesty" says: FOR EASIER INSTALLATION AND LONGER LASTING DEPENDABILITY, WIRE IT WITH CHESTER!

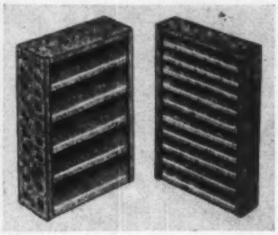
—for Smooth Pliability with Super-Durability

- OIL BURNER IGNITION CABLE
- THERMOSTAT CABLE
- TW BUILDING WIRE
- APPLIANCE WIRE
- ARMORED BUSHED CABLE
- FLEXIBLE STEEL CONDUIT
- INSTRUMENT WIRE
- NON-METALLIC SHEATHED CABLE

*DuPont Tradename

CHESTER
CABLE CORP.
® *A Subsidiary of Miami Copper Company*
30 HILL STREET, CHESTER, NEW YORK, U.S.A.
PIONEER PRODUCERS OF PLASTIC INSULATED WIRES AND CABLES

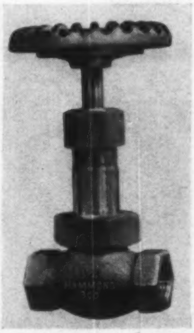
filter. "PO5 H-1" portable weighs 62 lb, measures 16⅞ in. wide, 11⅞ in. high, 15 in. deep. Unit rated to cool to 1200 cu ft, may be applied in multiple installations.



Louver Rails . . .

. . . developed to provide quick method for fabricating removable, hinged, stationary louvers—*Cain Mfg. Co., Dept. HPAC, 1111 N. Fifth Ave., Birmingham, Ala.*

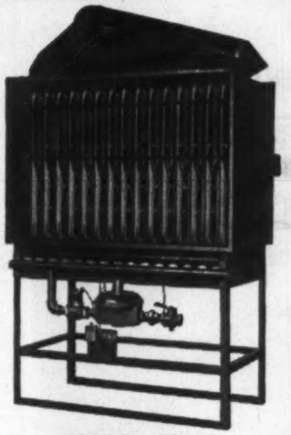
"Louverail", 24 gage galvanized rail, is 4½ in. wide, can be used to make louvers with thicknesses from 3¼ to 4½ in. Split in half, rail will make louvers from 1¼ to 1¾ in. thick. Two 50 ft. lengths of rail (one left rail and one right) are coiled together in dispenser-type carton. Button indentations are slotted to hold louver blades, which are peened with hammer for finished unit.



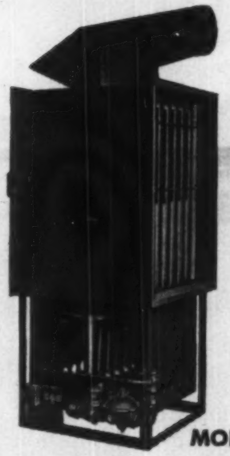
Globe Valve . . .

. . . intended for extreme resistance to corrosive action on seat bearings —*Hammond Brass Works, Dept. HPAC, 1844 Summer Blvd., Hammond, Ind.*

Plug type valves have 500 Brinnell hardened stainless steel renewable seat and disc for 150, 200, 300 lb working steam pressure. Valves available in sizes ¼ to 2 in.



MODEL SED-E

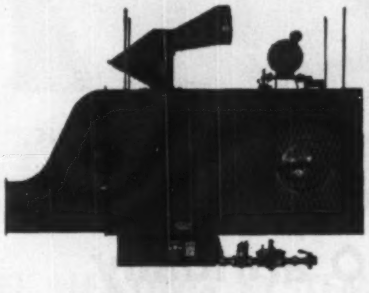


MODEL SED-S

MODEL SED-VF

MODEL SED-E — Non-corrosive type 321 stainless steel heat exchanger. Permits installation downstream of cooling equipment, for continuous blower operation. Air throughput in either direction. 80,000 to 600,000 Btu input.

MODEL SED-S — Same as SED-E except controls are at the side, instead of at the end where accessibility requires. Either SED-E or SED-S is available in sizes from 80,000 to 600,000 Btu input in increments of 40,000 Btu.



MODEL SEU

MODEL SED-VF — Tested and approved as a duct furnace; type 321 stainless steel. Re-circulated or fresh air enters through bottom, sides, or back. Built-in air bypass, vent in front. Sizes from 70,000 to 280,000 Btu input.

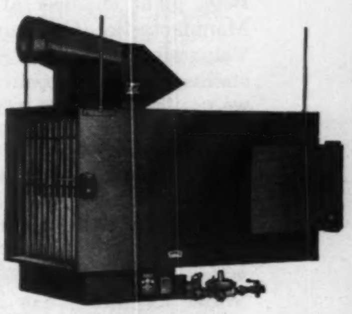
MODEL SEU — Suspended unit heater. Recirculates room air. Diffuser outlet with adjustable vertical and horizontal vanes. Double inlet forward curve blower. Continuous duty, variable pitch drives, raised port burners. 80,000 to 480,000 Btu input.

MODEL SEC

FURNACES

outstanding for commercial, industrial, schools, churches, theaters, large residential

HAYES FURNACE MFG. & SUPPLY CO.
3233 So. La Cienega Blvd., Los Angeles 16, California
Telephone TExas 0-3734



MODEL SES

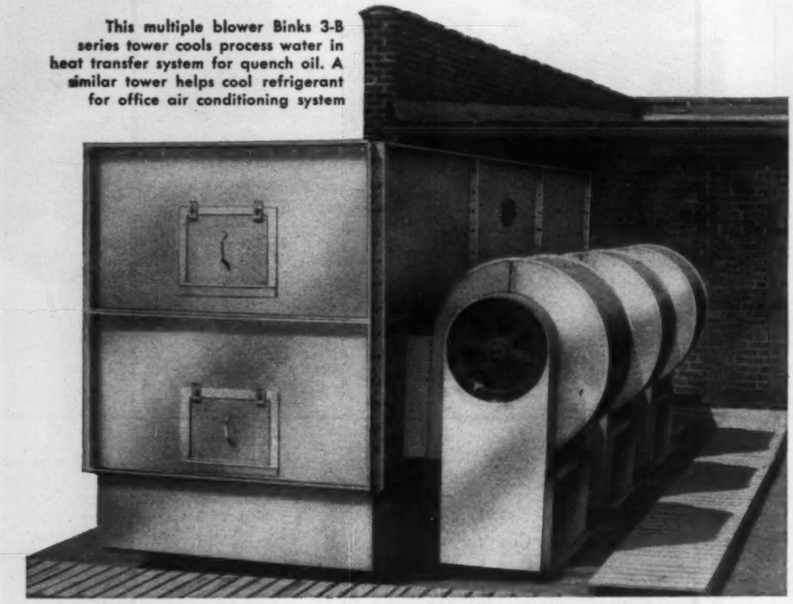
MODEL SEC — Forced air furnace. Stainless steel heat exchanger sections seam and arc welded. One piece cast iron burners with drilled ports. Oversize double inlet blower, glass or washable filters. 6 sizes — 70,000 to 245,000 Btu input. For zero clearance.

REPRESENTATIVES

M. Blazer & Son, Passaic, New Jersey.
Clark Equip. Co., Clearwater, Fla.
R. E. Holcombe, Atlanta, Georgia
Sinclair Heating Supplies, Ltd., Edmonton, Alberta, Canada.

Boyd Engineering Co., El Paso, Texas.
Reube O. Emery, Nashville, Tennessee.
F & D Distributors, Salt Lake City, Utah.
Leudecke Engineering Co., Austin, Texas.
McCombs Supply Co., Denver, Colorado.
O'Connor-Oklahoma Co., Oklahoma City, Tulsa, Oklahoma & Wichita, Kas.
Smith Steam Specialty Co., Kansas City, Mo.
Tay-Holbrook, Inc., San Francisco, California.
Dealers Supply Company, Atlanta, Georgia.
J. C. Lewis Company, Little Rock, Arkansas.
Nunn Electric Co., Lubbock, Texas.
Noland & Co., Newport News, Va.
Temp-Control Corp., Portland, Oregon

MODEL SES—Forced air, suspended furnace for installation in suspended duct system. Inlet and outlet designed for sheet metal duct connection. Double inlet forward curved blower. Continuous duty variable pitch drives, raised port burners.



This multiple blower Binks 3-B series tower cools process water in heat transfer system for quench oil. A similar tower helps cool refrigerant for office air conditioning system

BINKS TOWERS AT McGILL MANUFACTURING CO., INC.

cut cooling water usage 95%
...save $6,000 annually

"We were using 2,840 cubic feet of cooling water every day for our manufacturing processes and air conditioning," reports Mr. Max Boté, plant engineer at McGill Manufacturing Company, Inc., Valparaiso, Indiana. "Since installing two Binks cooling towers we use less than 200 cubic feet."

Control quench oil temperature
Bearing parts manufactured by McGill are heat treated. At 1500° F., the parts are cooled in quench oil which is held at 110° F. by a water-cooled heat transfer system. Water for the system is cycled through a Binks 3-B series cooling tower where its temperature is lowered 8° F. under all climatic conditions. A similar tower helps cool Freon 22 in the office air conditioning system.

Whisper-quiet operation
Tip speed of the squirrel cage blowers is one-third that of equal capacity propeller fan units. Their quietness permits installation next to windows or in building wells.

Minimum maintenance needed
All panels are heavily galvanized. Outside, they receive two coats of aluminum paint; inside, a durable zinc chromate coating. Blowers and motors are placed outside the moisture laden air stream. Decking is of heart redwood.

Send for complete data
Ask your Binks Branch Office, or write direct for a copy of Bulletin 477-A and 333. Binks engineers will be glad to answer your questions and help solve your particular cooling problems. There is no obligation.

8151

Binks
EVERYTHING FOR WATER COOLING

A COMPLETE LINE OF NATURAL DRAFT AND MECHANICAL DRAFT COOLING TOWERS AND INDUSTRIAL SPRAY NOZZLES

Binks Manufacturing Company
3118-38 Carroll Ave., Chicago 12, Ill.

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES • SEE YOUR CLASSIFIED ☎ DIRECTORY

EQUIPMENT DEVELOPMENTS

Continued

Water Regulating Valve . . .

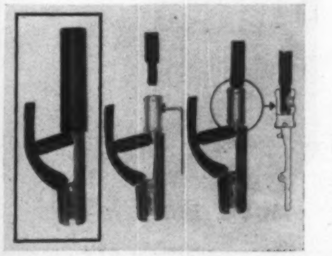
. . . for cooling tower service—*Penn Controls, Inc., Dept. HPAC, Goshen, Ind.*

Unit applicable to commercial refrigeration, air conditioning systems which may fall well below rated capacities unless head pressure is maintained within reasonable limits, manufacturer says. Three-way action permits water to be diverted from the condenser into bypass line to tower nozzles. Available in ½, ¾, 1, 1¼ in. sizes.

Air-Acetylene Torch . . .

. . . for servicing air conditioning, refrigeration equipment — *Smith Welding Equipment Corp., Dept. HPAC, 2633 Fourth St., S.E., Minneapolis* 14.

"Handi-Heet" is lightweight, adjustable to any position convenient to operator, says company, and flexible o-rings form gas tight seal between tip mixing section and torch head. Within each tip is individual mixer said to add correct amount of atmospheric air to acetylene to give desired flame. Designed to be attached to any acetylene tank. Six tips available.



Electrode Holders . . .

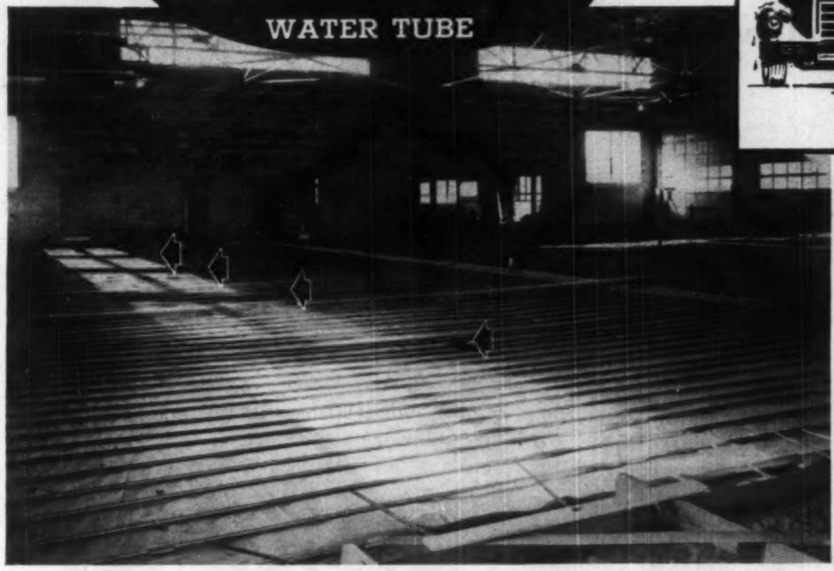
. . . designed for quick installation on welding cable—*Tweco Products, Inc., Dept. HPAC, P. O. Box 666, Wichita* 1.

By eliminating use of shim stock and pressure plate in installation, "Twecotong" ball point screw cable connection allows use of larger sizes of cable.

what they're doing with

REVERE COPPER

WATER TUBE



THE 10,000 FT. of ¾" Type "K" Revere Copper Water Tube used on this job was furnished by the Revere Distributor: FLANAGAN SUPPLY COMPANY, Oklahoma City. 20' straight lengths of hard copper were specified for the grid type installation. Note drains for carrying away melted ice and snow so floors can be kept clean and dry.

RADIANT PANEL HEATING SYSTEM DOES DOUBLE DUTY IN TRUCK DEPOT OF RISS & COMPANY, INC.

Oklahoma City

In planning their new depot Riss & Company, Inc., told the architect and builder they wanted a heating system that would de-ice the road equipment entering the shops for repairs and at the same time keep the concrete floor sufficiently warm and dry so that the mechanics, who spend 60% of their time on or near the floor, would be comfortable.

There seemed to be only one practical answer: Radiant panel heating. And as to the kind of material used for the panels: Revere Copper Water Tube. Here's why: Uniformity and proved quality of Revere Copper Water Tube. Easy-to-make solder fittings. The surety of tightness when solder fittings are used. The enduring and non-rusting qualities of Revere Copper Water Tube. And, as contractors tell us again and again, "Contrary to what has been said about the cost of copper, it has been our experience that, all things considered, copper costs less to install than rustable material." And they show us figures to prove it.

These same features, which are inherent in various types of Revere Copper Water Tube also make it the preference of contractors, architects and engineers for hot and cold water lines, underground service lines, air conditioning and processing lines. See the Revere Distributor nearest you for your needs.

NO NEED TO WORRY about catching cold on this floor. It's heated by radiant panels. Architect: HARRY L. WAGNER, Kansas City, Mo. Builder: SHAMROCK ENGINEERING & CONSTRUCTION COMPANY, Oklahoma City. Engineer: COLLINS & GOULD, Oklahoma City.

REVERE COPPER AND BRASS INCORPORATED
Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.

Mills: Rome, N. Y.; Baltimore, Md.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Brooklyn, N. Y.; Newport, Ark.; Ft. Calhoun, Neb. Sales Offices in Principal Cities, Distributors Everywhere.

HEV-E-OIL/HEV-E-DUTY gas burners

preferred throughout the world

In new installations and replacements, users of Hev-E-Oil and Hev-E-Duty Gas Burners the world over report significant reduction in costs plus better performance.

Boiler room of Berlin "Life" has three Hev-E-Oil Burners.

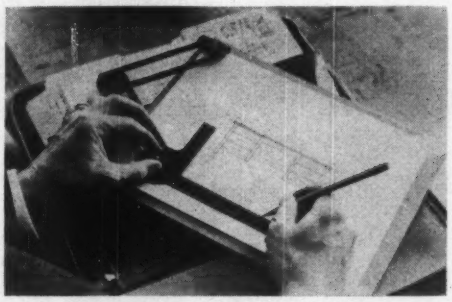
• • •

Complete line of burners is built in 8 sizes . . . 5 to 150 gph capacities . . . for boilers up to 500 hp.

Hev-E-Oil economy picked over 16 other burners for new Berlin Life Insurance Building

When Berlin Life Insurance installed Hev-E-Oil Burners in their new Wiesbaden office, it was another decision for economy and efficiency . . . more proof of the growing preference everywhere for Hev-E-Oil and Hev-E-Duty Gas Burners. Growing because they do offer the most practical approach to lowering heating costs. And because Industrial Combustion Burner design and dependability stand out in any comparison of heating systems. To find out how you can profit from this high heating efficiency, write Industrial Combustion, Inc., 4507 N. Oakland Ave., Milwaukee 11, Wisconsin, Dept. HPA-5.

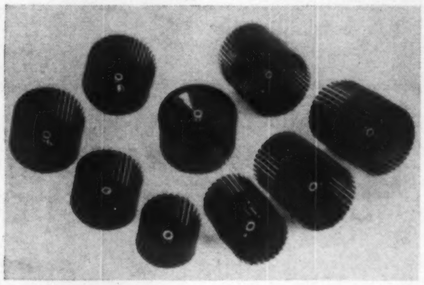
INDUSTRIAL COMBUSTION
INC.
EXECUTIVE OFFICE: 4507 N. OAKLAND AVENUE,
MILWAUKEE 11, WISCONSIN



Portable Drafting Machine . . .

. . . for office, workshop, field use — *David Miller & Assoc., Dept. HPAC, Box 572, Beverly Hills, Calif.*

"Draftette" attached to portable drawing board that fits into briefcase; may be detached from board that fold to fit into pocket, company says. Made of aluminum, unit available with 10 × 13, 11 × 17, 20 × 26 in. drawing boards.



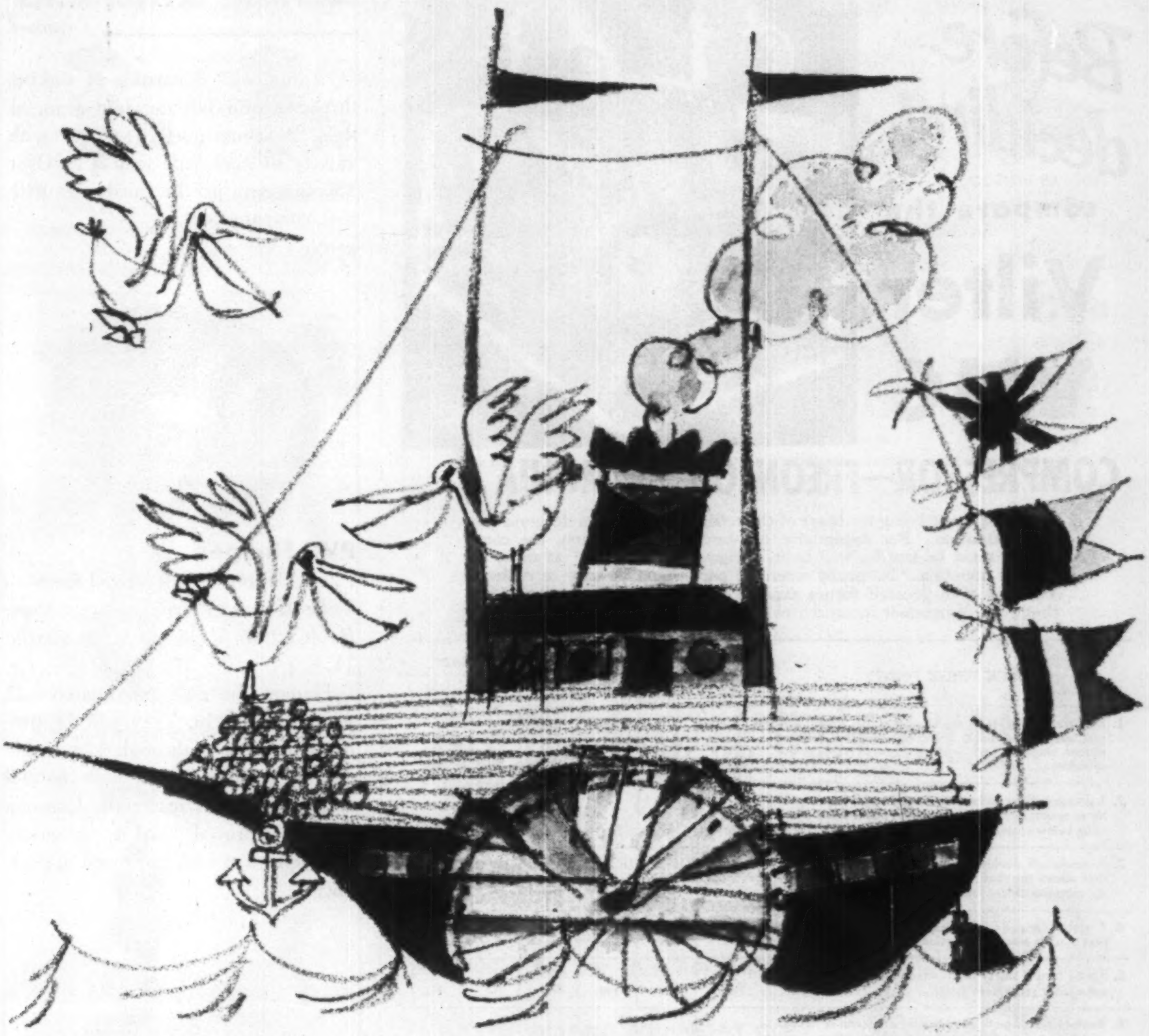
Blower Wheels . . .

. . . of molded plastic — *Denbo Engineering and Sales Co., Inc., Dept. HPAC,* 3301 *Martindale Ave., Indianapolis* 18.

Available in 5⅜, 6⅜, 7⅜, 8 in. diam as single or double inlet types. Blade lengths supplied from maximum length to custom. Hubs located inside or outside wheel. Standard stock bores: ½, ⅜, 5/16, in.; special hubs supplied.

Powder Actuated Fastening Tool . . .

. . . designed to stop overdriven fastener, eliminate danger of firing through thin work surface—*Ramset Fastening System, Winchester Western Div., Olin Mathieson Chemical Corp., Dept. HPAC,* 12117 *Berea Rd., Cleveland* 11.



You Can Import Water Tube...But You Can't Import SERVICE

Foreign water tube is sold on a *buyer beware* basis. You take it as it is. There's no way for you to get service or satisfaction when things go wrong—unless you want to take a trip abroad to get it.

With Bridgeport—made in U.S.A.—copper water tube, service and satisfaction are as close as the wholesaler who supplies it to you. He's backed by Bridgeport's factory-trained salesman and Bridgeport's long-standing reputation for quality, fair dealing and service. When you use Bridgeport you can be sure of uniformity of quality and dependability of service.

Bridgeport copper water tube is *nationally* known and *locally* backed. It pays to specify Bridgeport for your copper water tube needs.

BRASS Bridgeport CO.

MADE IN U.S.A. TO THE STANDARDS OF AMERICAN INDUSTRY

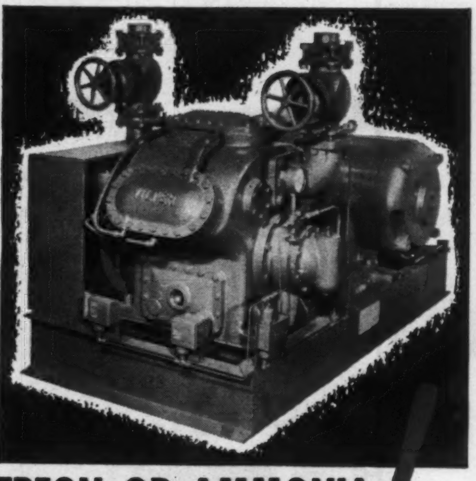
BRIDGEPORT COPPER WATER AND DRAINAGE TUBE

Bridgeport Brass Company, Bridgeport 2, Conn. • Sales Offices in Principal Cities • In Canada: Noranda Copper and Brass Limited, Montreal

Before deciding...

compare the

Vilter VMC



COMPRESSOR—FREON OR AMMONIA!

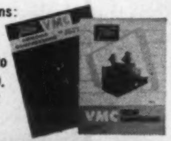
The compressor being the heart of the refrigeration system deserves the most attention. For dependable day-in-day-out operation, the compressor must be sturdy, well built, designed for long life. It must be easy to maintain. Naturally wearable parts must be easy to replace. You will save yourself future expense and needless worry if you see that your compressor incorporates the points below.

CHECK THESE POINTS	*VILTER*	*5 OTHER WELL-KNOWN MAKES*				
		A	*B*	*C*	*D*	*E*
1. Removable alloy steel cylinder sleeves that permit low cost, easy replacement. Eliminates need for oversize pistons, rings, etc., which are common in frame bored cylinders	Yes	Yes	No	No	Yes	Yes
2. A double bellows oil immersed shaft seal that prevents air or moisture from entering the system when operating below atmospheric pressure	Yes	No	No	No	No	No
3. A crankshaft double row roller bearing arrangement that allows the shaft to expand freely, thus preventing excessive thrust loads on the bearings	Yes	No	No	No	No	No
4. A statically and dynamically balanced crankshaft that assures smooth operation	Yes	Yes	Yes	Yes	—	Yes
5. Spring loaded safety heads that protect the compressor against refrigerant slugs	Yes	No	Yes	No	No	Yes
6. Removable connecting rod bearings that can be changed without also removing the connecting rod and piston assembly	Yes	No	Yes	Yes	Yes	Yes
7. Necessary to dismantle entire unit for repairs	No	No	Yes	Yes	No	No
8. Suitable for high stage or booster operation	Yes	Yes	No	No	Yes	Yes
9. Light weight aluminum pistons with upper half of piston wall having tapered thickness to conduct heat from top of piston. This prevents excessive piston expansion and reduces possibility of piston seizure	Yes	No	No	Yes	No	No
10. A separate oil filter, in addition to crankcase screen, to super-clean oil and thus reduce wear to a minimum	Yes	Yes	No	Yes	Yes	Yes

From this comparison, you know that *you get more for your money* with Vilter. It will pay you to consider Vilter for your next refrigeration or air conditioning installation.

Vilter®

WRITE for your FREE Vilter Bulletins: No. 817—"Vilter VMC Ammonia Compressors"—and No. 820—"Vilter VMC Freon Compressors"—to
THE VILTER MANUFACTURING CO.
Dept. F-719, 2217 South First Street
Milwaukee 7, Wisconsin



REFRIGERATION and AIR CONDITIONING

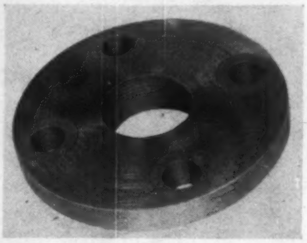
THE VILTER MANUFACTURING COMPANY, Milwaukee 7, Wisconsin

Air Units • Ammonia & Freon Compressors • Booster Compressors • Baudelot Coolers • Water & Brine Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pipe Coils • Valves & Fittings • Pakice & Polarflake Ice Machines

EQUIPMENT DEVELOPMENTS

Continued

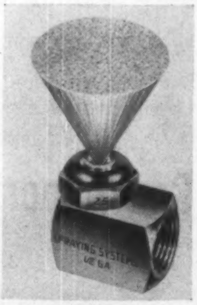
"Flite-Chek" is capable of sinking threaded stud fastener into 1 in. of steel. Recommended for use with variety of nonbrittle materials. Over 150 fasteners per hr can be set with tool, company says.



PVC Flanges . . .

. . . with concentric-serrated faces — *Tube Turns Plastics, Inc., Dept. HPAC, 2929 Magazine St., Louisville 11.*

Flanges have approximately 32 serrations per in. They will be produced in sizes ½ through 6 in. socket and threaded types in both normal and high impact materials. Features cited: improved gasket retention, more effective seal, improved appearance.



Spray Nozzles . . .

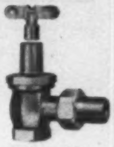
. . . designed to save time, space in installation—*Spraying Systems Co., Dept. HPAC, 3219 Randolph St., Bellwood, Ill.*

"FullJet" spray nozzle has 90 deg angle elbow turn in body of nozzle for installation where spray is directed at 90 deg angle to inlet pipe. Nozzles give full cone spray pattern, says company. Choice of spray angles offered: 65 deg and 120 deg wide angle types.

MARSH PACKLESS RADIATOR VALVES

WHEEL HANDLE

GRADUATED

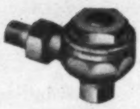

LOCK AND SHIELD

ANGLE PATTERN

GLOBE PATTERN

CORNER PATTERN (Sectional Below)

MARSH THERMOSTATIC RADIATOR TRAPS

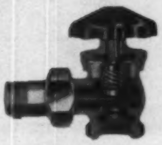

ANGLE PATTERN

STRAIGHTWAY PATTERN

VERTICAL PATTERN

LEFT HAND CORNER PATTERN

RIGHT HAND CORNER PATTERN


CUT OPEN VALVE

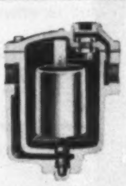
F & T TRAPS

No. 12, REPRESENTATIVE OF WIDE LINE

VENTS

No. 5 VENT, ONE OF MANY

BUCKET TRAPS


No. 500 INVERTED BUCKET TRAP

All the *best* of their kind!

You probably have made certain Marsh products your standbys without realizing there are a lot more of them just as superlative as the ones you like so well.

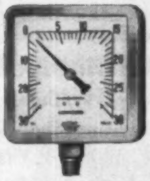
Make the acquaintance of some of them here, but, better still—***Ask for this Marsh Catalog!***

MARSH HEATING EQUIPMENT CO.
Sales affiliate of Jas. P. Marsh Corporation
DEPT. T, SKOKIE, ILL.
Marsh Instrument & Valve Co. (Canada) Ltd.
8407 103rd St., Edmonton, Alberta

MARSH
Heating Specialties since 1865

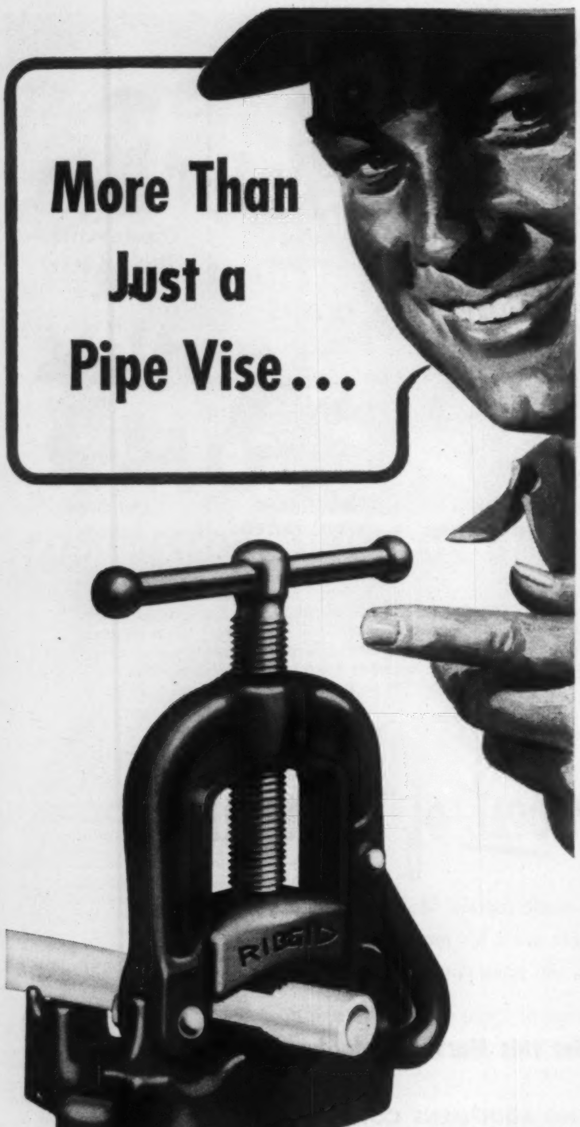
MARSH BOILER GAUGES

THER-ALTI-METER (Square and Round)


INTERNAL SYPHON (Square and Round)

OUNCE-GRADUATED RETARD (Also Compound)

STANDARD (Also Compound)


More Than Just a Pipe Vise...
RIDGID

Yoke or Chain Vises
⅛" to 6" capacities
Bench, Stand, Post or Kit

RIDGID

Pipe Vises give you most utility for your money

RIDGID LonGrip jaws take a firmer grip on pipe—and without chewing it up. Most of these vises have handy work-tray bases, pipe rests and pipe benders, doing more for you than merely holding pipe. It pays you to ask for RIDGID at your Supply House.

[illegible]

EQUIPMENT DEVELOPMENTS

Continued

Insulating-Finishing Cement . . .

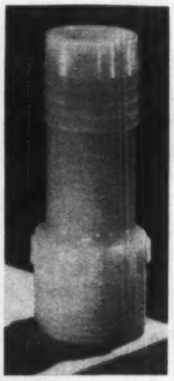
. . .developed to provide 30 percent more dry coverage, white insulating finish—*Industrial Insulation Div., Baldwin-Hill Co., Dept. HPAC,* 500 *Breunig Ave., Trenton* 2, *N. J.*

Field tests of "Super Powerhouse Cement" indicate that 100 lb of material covers area 72 sq ft, ½ in. thick, says company. Can be applied directly to hot irregular surfaces, such as valves, fittings, over other insulations. Gray when applied, dries to white surface when finish trowelled. Cement remains workable for 1 hr, sets to initial hardness in 2 to 3 hr. Withstands rain after initial set, can be painted when wet or dry.

Steam Meter . . .

. . .modified with addition of pressure compensating counter box — *Builders-Providence, Inc., Dept. HPAC,* 345 *Harris Ave., Providence* 1.

With addition, "Shuntflo" meter automatically and continuously corrects for pressure variations in the steam line, registering consumption in pounds of steam even when major pressure fluctuations are encountered, says manufacturer. With meters now in service, new feature can be added by replacing standard counter box. Complete unit can be obtained for 1 to 12 in. steam lines.



Plastic Pipe Fittings . . .

. . .of synthetic fabric insert type for flexible polyethylene pipe — *Industrial Plastic Fittings Co.,* 3891 *W.* 150*th St., Cleveland* 11.

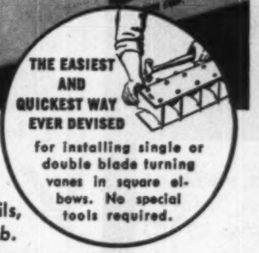
Fittings resist pressure of 1600 psi, company says, also withstand temperatures exceeding 250 F.

put
Extra-Profits
in your
pocket
with

"engineer-approved"

ELGEN *All-Tite* VANE RUNNERS
NOW IN COILS!

OPEN THIS END
PULL HERE THIS END UP
Save Time and Money ... with ELGEN All-Tite
VANE RUNNERS


THE EASIEST AND QUICKEST WAY EVER DEVISED
for installing single or double blade turning vanes in square elbows. No special tools required.

New production machinery of our own exclusive design, now enables us to produce button type Elgen All-Tite vane runners in continuous coils, effecting a savings in your *cost per job*.

COILED ELGEN ALL-TITE VANE RUNNERS MEANS . . .

- *Less Waste!* Waste pieces due to short ends are a thing of the past. Vane runner metal is coiled in 100 foot lengths, you just pull out the exact footage needed.
- *Easier Storage!* Each coil weighs approximately 50 lbs. and is packed in a box 28" x 28" x 5". Box fits easily under bench or against wall.
- *Easier Handling!* No loose pieces lying around to get in the way or collect dirt.
- *Unrolls absolutely flat!* Vane runner metal emerges from the box at bench height . . . absolutely flat . . . ready for use.

TWO MORE ENGINEER-APPROVED ELGEN PRODUCTS THAT SAVE YOU TIME AND MONEY

ELGEN SILENT DUCT

. . . for forming "flexible" duct connectors. A one piece metal to material unit, packed in coils, unrolls absolutely flat. Makes on the spot work a cinch.

ELGEN DAMPERSET

. . . for multi-blade dampers, parallel or opposed. Most perfect damper hardware developed.

ELGEN PRODUCTS ARE SOLD THROUGH LEADING JOBBERS EVERYWHERE.

Write today for free catalog and "spec" sheet!

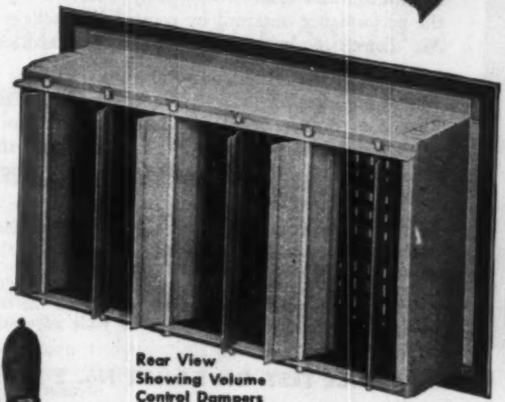
ELGEN MANUFACTURING CORP.
41-34 39th Street, Long Island City 4, N. Y.

INDEPENDENT

"Fabrikated"
REG. U. S. PAT. OFFICE

[illegible] CORE REGISTERS
with [illegible] Blade Dampers
key control
[illegible] commercial installations

No. 27
Adjustable Vertical Front Bars
Adjustable Horizontal Rear Bars



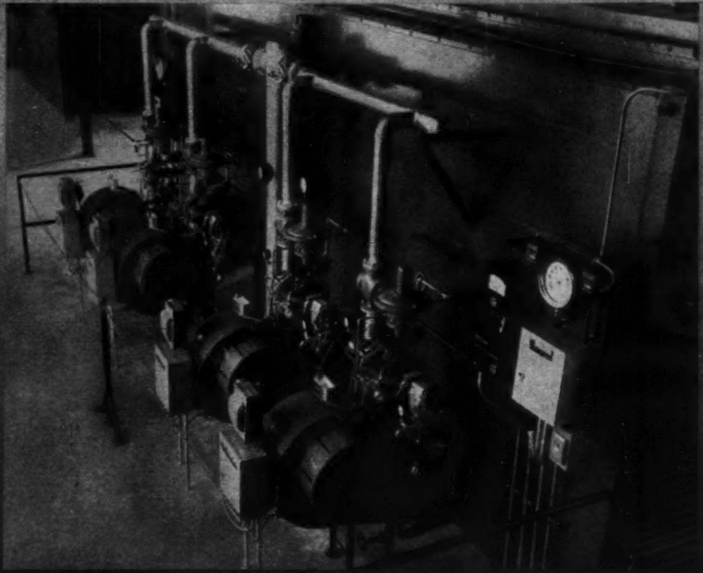
Rear View
Showing Volume
Control Dampers

Write for Catalog
No. 58 which gives
complete details and sizes
up to 48" x 24"

Always leading—
Always Progressing

THE INDEPENDENT REGISTER CO.
3747 E. 93rd STREET · CLEVELAND, OHIO

35 Years Old...
Better Than New
... with Mettler Gas Conversion Burners



Installation above, on two big power boilers in a college plant, typifies the performance obtained by using fully packaged automatic "Fan-Air" conversion burners to make old boilers perform like new.

The 375-bhp watertube four-drum units without superheat or water walls were installed in 1922. Thirty-five years later four new Mettler "Fan-Air" Burners enable the boilers to exceed original capacity and efficiency! Below, performance tests on one boiler show 79.05% over-all efficiency. Other boiler tested at 78.25%. The four burners yield 75,000,000 Btu input.

WRITE FOR DETAILS—Mettler "Fan-Air" gas or combination gas/oil burners come with automatic cycling preset to your requirements. You simply specify package for forced, induced, or natural draft, cataloged by inputs of 400,000 to 30,000,000 Btu/hr. Bulletin G-200B gives full details on the features behind Mettler efficient burning and wide adjustability. Request copies today!

PERFORMANCE TEST ON BOILER No. 1 AFTER MODERNIZATION

Boiler	Fuel	Input	Stack Temp.	Ambient Temp.	Steam Press. Gage	Feed Water	Steam Flow	% Nominal Rating	Over-all Efficiency
B & W No. 1	Natural gas 940 Btu	40149 CFH 37832 M Btu	517°F	75°F	134.2	212°F	29523 PPH	228	79.05%

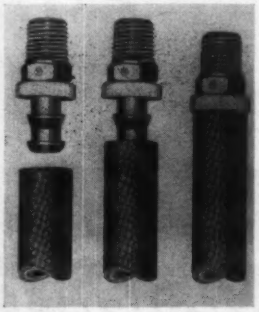
ALL TABULATED FIGURES ARE AVERAGES ON EACH RUN.

Eclipse

THE METTLER CO., INC.
Division of ECLIPSE FUEL ENGINEERING CO.
4366 Worth Street, Los Angeles 63, California

EQUIPMENT DEVELOPMENTS

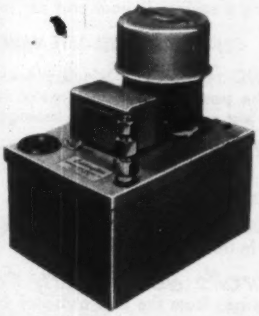
Continued



Hose Ends . . .

. . . with push-on feature, developed for faster hose assembly installations —*Weatherhead Co., Ft. Wayne Div., 128 W. Washington Blvd., Ft. Wayne, Ind.*

To assemble, "Barb-Tite" hose ends are pushed onto barbed inserts. Machined from tough dense extruded bar stock, manufacturer says hose ends withstand working pressures up to 250 psi, with minimum burst pressure of 1000 psi. Available in popular end styles in sizes 1/4 through 3/4 in. diam.



Condensate Disposal Unit

. . . for the removal of condensation from air conditioning, refrigeration, dehumidifying units—*Eddington Metal Specialty Co., Dept. HPAC, P. O. Box K, Eddington, Pa.*

"Model C-12" is equipped with hydromechanical two level device, provides 20 ft head. Tank measures 6 × 8 in., with 10 in. height to top of motor. Unit is recommended by manufacturer for the removal of condensation in air conditioning, refrigeration and dehumidifying applications.

6 NEW ECONOMIES IN ELECTRONIC AIR CLEANING

Here's 6 ways you cut costs with the new high velocity **ELECTROMAZE**

1. Production-engineered for Economy. Appreciable savings in manufacture are passed on to you to give you more air cleaning capacity per dollar than other air cleaners.

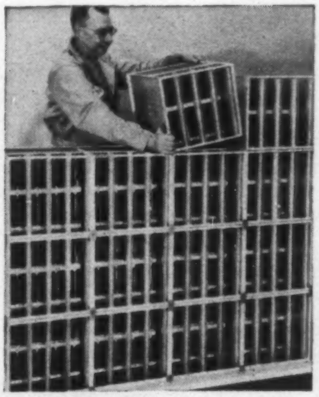
2. High Cleaning Efficiency. Even at high face velocities, Electromaze delivers high dirt removing efficiency . . . 85% to 95% depending upon velocity.

3. Fast, Simple to Install. There are no holding frames to buy and install. Electromaze unit cells simply assemble like building blocks.

4. Lower Installed Cost. Corrosion resisting, all-aluminum construction, plus frameless design eliminate unneeded weight and shipping charges . . . but without sacrifice in strength or performance.

5. Takes Less Space. Electromaze cleans 50% more air in the same space to save valuable floor area.

6. Needs Less Maintenance. Vacuum tubes and outages are completely eliminated by the use of a selenium rectifier. With single voltage construction, there are fewer power connections to install and maintain.



Frameless Construction but Solid as a Skyscraper. Strong, light, all-aluminum cells assemble like building blocks. Are interlocked and held together with stainless steel clips.

FOR COMPLETE INFORMATION

For the nearest Air-Maze representative . . . See the Yellow Pages of your Telephone Directory . . . or write Air-Maze Corporation, Cleveland 28, Ohio, Department HP-5.

AFI MEMBER AIR FILTER INSTITUTE

AIR-MAZE

The Filter Engineers

Air Filters • Silencers • Spark Arresters • Liquid Filters • Oil Separators • Grease Filters

Equipment Briefs . . .

NEGATIVE ION GENERATORS available in 1958 room air conditioners — *Philco Corp., Dept. HPAC, Tioga and C Sts., Philadelphia* 34. Ionitron available in kit form for "Bantam" models; factory installed in "Compact" series. In addition to discharging negative ions into room, electrical charge used to create negative ions also acts as electronic dust magnet to filter out microscopic dust particles. Negative ion charge gives minute dust particles negative charge; particles then attracted to grounded filter, company says.

SOLDERING FLUX for stainless and nickel-chrome alloys—*Anchor Metal Co., Inc., Dept. HPAC,* 966 *Meeker Ave., Brooklyn* 22. Organic base flux, "No. 302", strips oxides from stainless steel, steel, nickel and nickel-chromium alloys, without use of zinc or ammonium chlorides, acids or rosin. Intended for uses requiring active flux without corrosion.

PORTABLE AIR CONDITIONER with new mounting principle—*Fedders-Quigan Corp., Dept. HPAC,* 58-01 *Grand Ave., Maspeth, N. Y.* Makes installation possible within few minutes, says company "Minute Mount" weighs 67 lb, height and depth 12½ in., 20 in. wide. Compressor is ½ hp, 7½ amps in pancake design, develops 4600 Btu.

BOILERS given 20 year guarantee by manufacturer—*Burnham Corp., Dept. HPAC, Main St., Irvington, N.Y.* Cored cast iron sections of the following cast iron hot water heating boilers in company's line have been given 20 year guarantee: "Jubilee," "Pace-Pak," "Pace-maker," "Yello-Jacket," or "Holiday" boilers. Applies to boilers manufactured after January 1, 1958. Guarantees against defective materials or workmanship.

TRANSFORMERS designed so that any standard raceway can be attached directly to transformer by suitable conduit fitting securely fastened into housing of transformer — *Hindle Transformer Co., Dept. HPAC, Flemington, N. J.* All transformers in company's control transformer line are to be equipped with these electrical conduit and cable fittings. Will be available for conduit sizes through 1 in.

CAB COOLER in self-powered, self-contained unit, with casing of lightweight, weather resistant glass fiber — *D. W. Onan & Sons, Inc., Dept. HPAC,* 2515 *University Ave., Minneapolis.* "Kab Kooler" can be mounted on roof of truck cabs, commercial and passenger vehicles with minor installation work. Self-powered unit has air cooled engine, includes company's 4.32 cu in. compressor.

AIR CONDITIONERS in five new lines — *Amana Refrigeration, Inc., Dept. HPAC, Amana, Iowa.* New lines are "Year 'Round," "Air Command," "Decorator," "Slim-Lo," "Compact." Nearly all models have two-speed motors; have new dynel fiber statically charged filters, company says. Installation kit furnished with each model.

ELECTRODE developed to meet requirements for multiple and single-pass welding of pressure vessels—*National Cylinder Gas Co., Dept. HPAC,* 840 *N. Michigan, Ave., Chicago* 11. "NCG-111-A" is flux-cored electrode intended to weld all carbon steels to 0.35 percent carbon content and AS212 type steel.

PEN KIT assembled to speed template, lettering guide work—*Laramie Chemical Corp., Dept. HPAC,* 290 *Main St., Stamford, Conn.* "Omnigraphos" kit combines fountain barrelled pen and 12 width set tubular nibs to draw or match ink lines 0.3 mm to 2.5 mm.

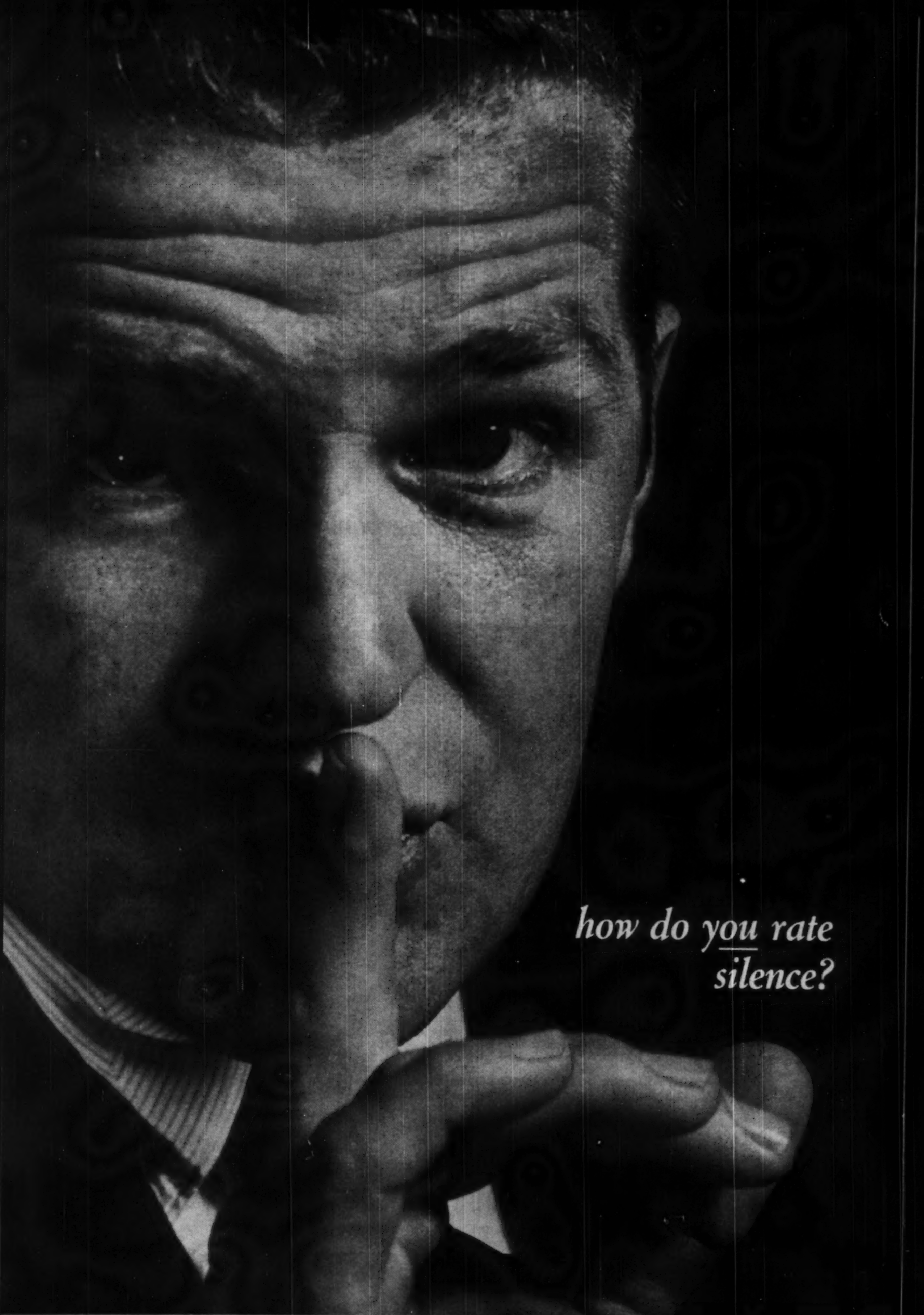
PORTABLE SCAFFOLD for overhead spot maintenance at heights to 30 ft—*Up-Right Scaffolds, Dept. HPAC,* 1013 *Pardee, Berkeley, Calif.* "Tallescope" scaffold is lightweight, can be assembled by one man, says company. Legs adjustable for uneven floors or stairways. Folds down for entrance through doorways, etc., it 29 in. wide. Separates into three components.

DRAWING BOARDS adaptable for desk or table—*Zee Co., Dept. HPAC, P. O. Box* 519, *Church Street Sta., New York* 8. Adjustable folding legs of "Ezee slide" drawing board allow variation of inclination from horizontal to 1 (vertical) on 4.5 (horizontal). Models "101" and "201"—¾ × 31 × 42 in.; model "202"—¾ × 35 × 48 in.

PORTABLE DRAWING BOARD molded of polystyrene — *Leslie Creations, Dept. HPAC, Lafayette Hill, Pa.* Board, which weighs less than 8 oz, comes with two transparent plastic triangles — 30/60, 45 deg. Four recessed spring clips hold standard 8½ × 11 in. sheet of paper. Board measures 10 × 12 in.

AIR CONDITIONING UNIT in built-in wall model—*Lewyt Air Conditioning Corp., Dept. HPAC,* 5702 *First Ave., Brooklyn.* Each unit connected with building's hot water heating system, built-in coils installed according to size of room. System has 1 ton cooling capacity, controlled by thermostat. Unit does not project into room, no outside overhang.

AIR PURIFICATION by portable electronic device with easy installation—*Puritron Corp., Dept. HPAC,* 15 *Stiles St., New Haven, Conn.* "Puritron" unit houses series of ultraviolet lamps, filter, circulator. Operates on 110 volt a-c line. Available in two models: "Executive," for larger areas, and "Director". ‡


how do you rate
silence?

when it's ventilating equipment . . . **consulting engineers**

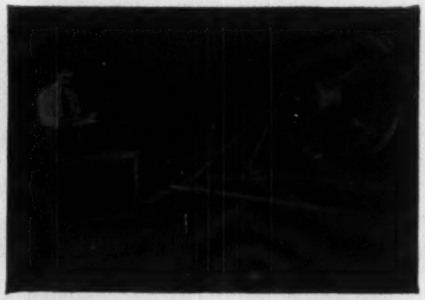
What factors are most important to men who specify ventilating equipment? What features do they look for first to make sure equipment is high quality?

A recent nationwide survey made by an independent research organization for Ilg throws considerable light on the subject . . . proves conclusively that "quietness of oper-

Here's how ILG *propeller fans assure quiet operation,*

What's in a Name? Plenty—when the name is Ilg. This "One-Name-Plate" guarantee covers *both* the quiet-running, self-cooled motor *and* the dynamically balanced, patented design fan wheel. Whether you specify or install Ilg Direct Drive Propeller Fans, you can count on quiet, vibration-free operation, low operating costs. For Ilg Type "Q" Fans and Ilg enclosed motors are designed, built, assembled and tested under one roof to exhaust *more* air *more* quietly for *more* years.

"Inhale . . . Exhale." Follow the flame and see why Ilg self-cooled, enclosed, permanently lubricated motors stay cleaner, run quieter, last longer. Fresh air (flame, here) enters vent pipe, circulates through motor, exhausts at front of fan. Ilg permanent-split capacitor single-phase and 3-phase motors never run "hot," have no wearing parts.



"Silence Is Golden." Ilg Propeller Fans feature direct drive to eliminate the noise, slippage and friction losses of belts and pulleys. In addition to "quietness tests," all Ilg Fans undergo exhaustive balancing tests to motor rotors and fan wheels before and after assembly to assure smooth, quiet operation.

For fans built to satisfy your "specs" . . .

rate quiet operation No. 1 in preference poll

ation" rates *first* with consulting engineers who specify fans and ventilating equipment.

You can look to Ilg Fans and Ventilators for quietness coupled with high air volume. Consulting engineers choose Ilg because Ilg equipment combines so many of the points of quality they insist on: vibration-free operation, for example; long life; low maintenance expense; ease of repair; low operating costs—just to name a few.

Some of the reasons Ilg equipment rates so high with those who specify are shown below. For complete details on Ilg Propeller Fans, write for Catalog No. 153; on Ilg Airfoil Centrifugal Fans, send for Bulletin No. 257.

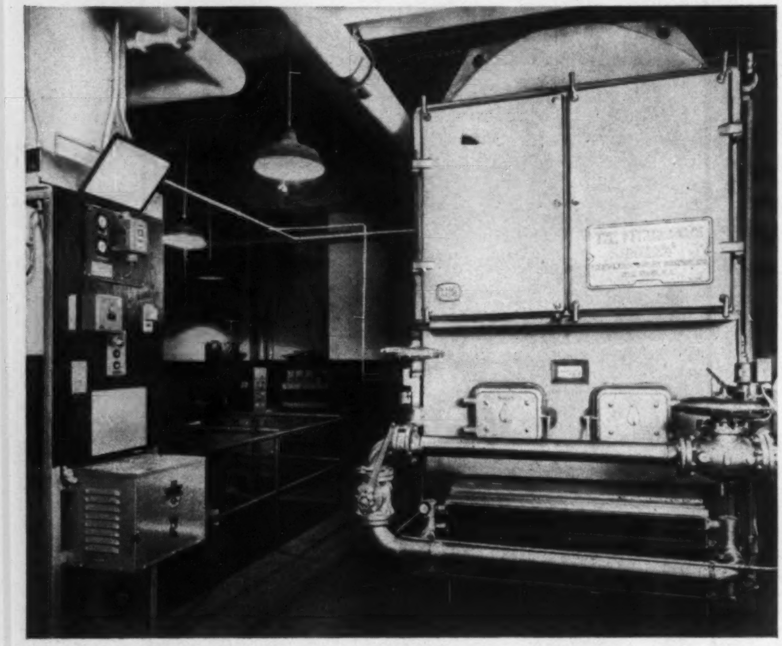
and ILG centrifugal fans vibration-free performance, low maintenance

Backward Is Forward. Ilg Backward Curved (BC) Blades and Airfoil design—the greatest step *forward* in blade design in 40 years—eliminate eddy currents and turbulence to assure quieter operation, undergo *less* drag and shock loss than blades of uniform thickness. Sound tests prove these fans can run at greater speed than older types —with *no increase in sound level.* For operations up to 9" static pressure.

Single, Silent Centrifugal. Direct-connected Ilg-built motors and Airfoil fan wheels rotate as a *single unit*—on heavy-duty, permanently lubricated ball bearings. No belts or pulleys to slip, re-align or replace periodically. No need for space-wasting separate motor mountings. Just connect an Ilg BC Airfoil Centrifugal and you're ready for any ventilating and air-conditioning job.

specify ILG

ILG ELECTRIC VENTILATING COMPANY
2826 N. Pulaski Road, Chicago 41, Illinois
Offices in 57 Principal Cities



A FITZGIBBONS BOILER
in the penthouse

The whole heating and cooling system for this brand new Sears Roebuck store in Amarillo, Texas, has been located on the roof to save costs in construction.
This is just one of the many unique features of this excellently designed building.
The hot water heating system is built around a Fitzgibbons "D" Type Boiler that is fired with a Webster in-shot gas burner with modulated pneumatic combustion controls. Induced draft is supplied by a Wing fan.
The Fitzgibbons "D" Type Boiler was selected because of its proven high efficiency, its excellent construction, and its ease of maintenance.

Architect:
George L. Dahl,
Dallas, Texas
Mechanical
Contractor:
Plains Plumbing
Company,
Amarillo, Texas

• For more information on this and other Fitzgibbons Boilers, write the company.

Fitzgibbons
Boiler Company, Inc.
New York Sales and Executive Office: 101 Park Avenue, New York 17, N.Y.
Field Sales Office and Plant: Oswego, New York
Branches and Representatives in Principal Cities
Dept. 20

RECENT TRADE LITERATURE . . .

▶ *AIR CONDITIONING BULLETIN* — New, 4 page bulletin gives information on staged cycle and closed reversing cycle methods of air conditioning. Bulletin also describes advantages, features of manufacturer's line of equipment. List of installations also included. *A. I. McFarlan Co., Inc., Dept. HPAC*, 90 *West St., New York* 6.

▶ *AIR CONDITIONING PRODUCTS* — Catalog "R-358" shows company's line of refrigeration, air conditioning products in 26 pages. New items include: charging and testing units (single or double gage style); color coded charging lines; small service valves; new sizes, fittings in other products. Catalog also features line of "Wimco" tube working tools. *Madden Brass Products Co., Dept. HPAC, P. O. Box* 444, *Aurora, Ill.*

▶ *AIR COOLED CONDENSER* — New catalog "34C8a" presents manufacturer's "Dricon" air cooled condenser line. Publication now includes information on models "DC-30" and "DC-40," rated at 30 and 40 tons. Units can be used in multiples. *Recold Corp., Dept. HPAC,* 7250 *E. Slauson Ave., Los Angeles* 22.

▶ *AIR DIFFUSER* — "Paraflo," a combined light and air diffusing troffer is described in folder "31-F-2." Folder is illustrated and diagrammed. *Day-Brite Lighting, Inc., Dept. HPAC,* 6260 *N. Broadway, St. Louis* 15.

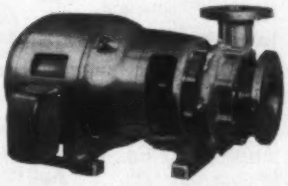
▶ *AIR-OVER MOTORS* — Bulletin B-2505 explains operation of air-over motors in propeller, axial flow fan applications. Units increase in horsepower output in direct relation to velocity of air swept over each motor frame surface by fan it powers within mechanical limitations, company

McDONALD PUMPS

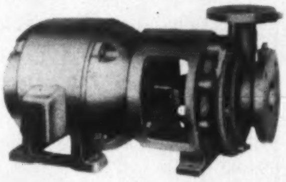
are made better to give you

BETTER SERVICE

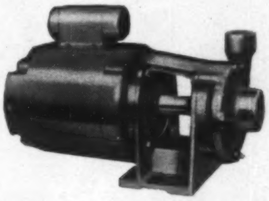
in air conditioning systems



7520 High head centrifugal pumps, capacities to 950 G.P.M. Ideal operating range, 280 feet down to 150 feet T.D.H. Sizes 1½" to 4" discharge; motors 2 to 60 H.P. Single and 3 phase.



7620 Moderate head centrifugal pumps, capacities to 280 G.P.M. Ideal operating range 150 feet down to 50 feet T.D.H. Sizes: 1¼", 1½" discharge (threaded connections), 2" discharge (flanged connections). Motors 1 to 10 H.P. Single and 3 phase.



7720 Fractional horsepower centrifugal pumps, capacities to 70 G.P.M. Total heads, 20 to 85 feet. Sizes ¾" discharge on ¼ or ⅓ H.P. motors; 1" discharge on ½, ¾ or 1 H.P. motors. Single and 3 phase.

McDonald's Close-Coupled Centrifugals are made better of better materials to serve your air conditioning needs best. They're ideally suited for cooling tower installations, hot and chilled water circulation and booster service.

BRONZE FITTED

Impeller, case ring, shaft sleeve and gland are made of durable bronze — give you more years of trouble-free service.

CLOSE-COUPLED

Pump is mounted directly on motor shaft, impeller is keyed and locked to the shaft — close coupling assures correct alignment throughout the life of the pump.

ACCURATE VOLUTE

Carefully engineered for correct hydraulic relation—assures high efficiency performance throughout the range of the pump.

McDonald Centrifugals are simple and sturdy. There are no couplings. Base design eliminates expensive foundations and requires minimum space. N.E.M.A. pump motors are used exclusively. Contact your McDonald dealer, or write for complete information.

OVER A CENTURY OF SERVICE SINCE 1856 McDonald YESTERDAY-TODAY-TOMORROW

A. Y. McDONALD MFG. CO. DUBUQUE, IOWA

PUMPS • BRASS GOODS • DRAINS • OIL EQUIPMENT

Engineered for years ahead HEAT EXCHANGERS

Out of fifty years of experience in fabricating unfired pressure vessels comes a new line of "standardized-customized" heat transfer equipment. These Ellicott Heat Exchangers are engineered to produce the most efficient transfer of heat and to minimize the electrolytic corrosive action that shortens exchanger life and reduces efficiency. Whether you need Instantaneous Water Heaters, Converters, Fuel Oil Heaters, Preheaters or special designed heat exchangers, specify Ellicott for heat transfer equipment that is engineered for years ahead.

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THERE'S NO EQUAL

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HOT WATER GENERATORS | STORAGE TANKS | SPECIAL LININGS | SPECIAL FABRICATION

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Clare and Kloman Streets • Baltimore 30, Maryland

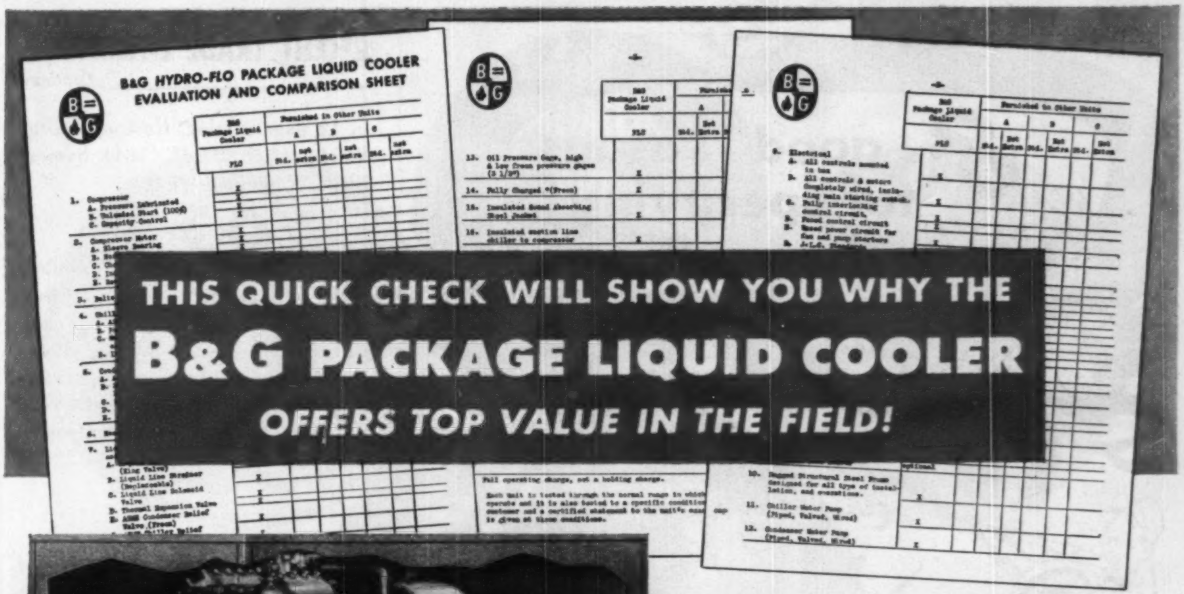
says. Among features cited by company: higher output horsepower, lower operating temperature, longer service life. *Reliance Electric and Engineering Co., Dept. HPAC,* 24701 *Euclid Ave., Cleveland* 17.

▶ *ARC WELDING* — Company's 12 page catalog "No. 11" illustrates, describes line of arc welding cables, connections. Complete tables of dimensions are given for each series. *Tweco Products, Inc., Dept. HPAC, P. O. Box* 666, *Wichita* 1.

▶ *BLAST COIL HEATERS* — Bulletin "E-87P" outlines uses of electric blast coil heaters with package air conditioners. Dimensional data, specifications for various package brands given in table form. Wiring diagrams show installation setups. Heaters and accessories illustrated, described. *Industrial Engineering and Equipment Co., Dept. HPAC,* 24 *Hanley Industrial Ct., St. Louis.*

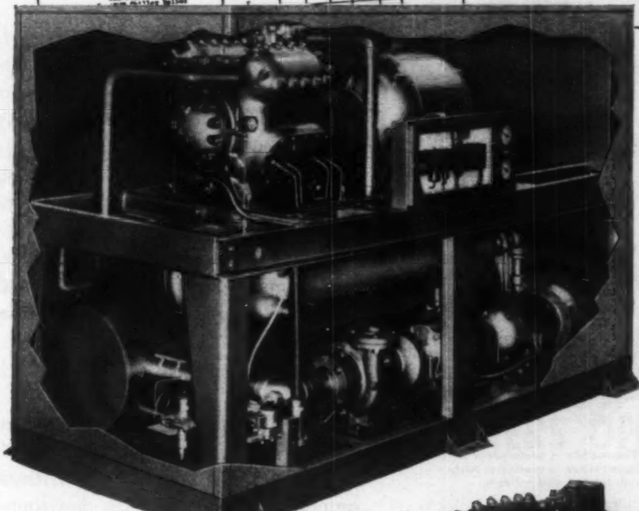
▶ *BLOWER UNITS* — Performance characteristics, important dimensions of company's "Vari-Basic" units in sizes "916," "1020," "1220" published in 6 page technical bulletin. Performance curves for each of two widths of each unit give static pressure, bhp as functions of flow rate output at four motor speeds. Tables give 15 dimensional specifications for sizes in two widths for four discharge positions: top horizontal, bottom horizontal, upward, downward. *Torrington Mfg. Co., Dept. HPAC, Torrington, Conn.*

▶ *BRONZE VALVES* — Company's 1958 catalog covers line of bronze valves for industrial, government specification, commercial, original equipment application. Special sections given to line of heavy duty valves, heating specialties, solder joint valves. Dimensional information, comparison chart also included



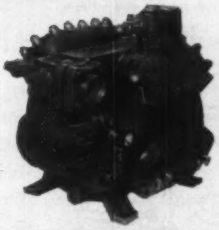
B&G HYDRO-FLO PACKAGE LIQUID COOLER EVALUATION AND COMPARISON SHEET

THIS QUICK CHECK WILL SHOW YOU WHY THE B&G PACKAGE LIQUID COOLER OFFERS TOP VALUE IN THE FIELD!

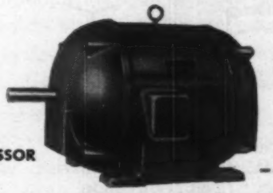


EQUIPPED WITH B&G PRODUCTS THROUGHOUT

The only unit of its kind with all major components designed, built and guaranteed by one manufacturer.



B&G COMPRESSOR



B&G COMPRESSOR MOTOR

BELL & GOSSETT COMPANY

Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong Ltd.,
1400 O'Connor Drive, Toronto 16, Ontario

Send for a set of Evaluation Charts as illustrated above—compare the *standard* equipment of the B&G Package Liquid Cooler with that of any other. You'll see for yourself that *you can buy B&G quality at smaller installed cost!*

With this *completely packaged* unit, costs which might otherwise be charged against the job are eliminated. For example—

No inside wiring costs. The finest electrical controls are furnished, *completely wired and fully interlocked!*

No inside piping costs. Both chiller and condenser pumps are sized to specification, mounted, piped and electrically interlocked.

No structural framing costs. All equipment is mounted on a rugged steel frame—a permanent base.

No metal forming costs. Standard equipment includes a heavy gauge steel jacket with sound-deadening undercoating and Hammerloid finish.

No insulating costs. The suction line and heat exchanger are fully insulated.

No testing costs. Fully tested under specified operating conditions and also under varying load conditions. All valves adjusted and balanced.

No extras to buy. Standard equipment includes gauges, compressor motor, all belts, driving sheave, compressor fly wheel, increment start, full sized heat exchanger and full operating charge of Freon.

Capacities: Ten units from 7½ to 75 tons

BELL & GOSSETT COMPANY, Dept. RFG-5, Morton Grove, Ill.

Please send complete file of data on B&G Package Liquid Coolers.

*Name*____________________

*Firm Name*____________________

*Address*____________________

*City*__________ *Zone*_____ *State*________

8...good reasons for specifying Thermaflex ducting!
Thermaflex has extreme flexibility. Forms by hand to any bend, easily snakes around obstacles.
Thermaflex is flameproof. It will not support combustion.
Thermaflex is light and easy to handle . . . but built to "take it."
0°-250°
Thermaflex has a broad temperature range. Conveys air at temperatures from 0°F to 250°F.
Thermaflex is waterproof . . . impervious to moisture, rust, rot, fungus and mildew.
Thermaflex has excellent air flow characteristics.
Thermaflex tends to deaden systemic noise.
Thermaflex installs without special tools.

Thermaflex® is designed to be used as a connector between main lines and diffusers or sound boxes in high- and low-pressure air conditioning systems. Two types are now available: Thermaflex-A, a standard in the industry for years, and Thermaflex-ST, a new, lower-priced companion line. For full information, write Dept. 75.

Flexible Tubing
CORPORATION
GUILFORD, CONNECTICUT
ANAHEIM, CALIFORNIA • HILLSIDE, ILLINOIS

RECENT TRADE LITERATURE

Continued

in 12 page catalog. *Hammond Brass Works, Dept. HPAC, 1844 Summer Blvd., Hammond, Ind.*

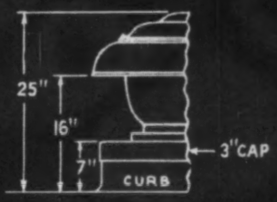
▶ *BRONZE VALVES* — Bulletin gives information on manufacturer's 150 lb bronze globe, angle and check valves, giving service ratings, dimensional drawings for each type valve, exploded view of globe valve with matching text for each component. *Walworth Co., Dept. HPAC,* 750 *Third Ave., New York* 17.

▶ *CENTRIFUGAL PRECIPITATOR* — New bulletin "276" describes manufacturer's "Skimmer", a medium efficiency, low pressure drop centrifugal precipitator. Included are drawings, photographs showing unit construction, dimensions, different arrangements. Unit is available in 13 sizes for air volumes 600 to 40,000 cfm. *American Air Filter Co., Dept. PD-HPAC,* 215 *Central Ave., Louisville* 8.

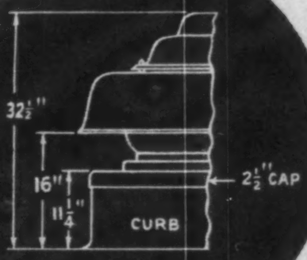
▶ *CENTRIFUGAL PUMP* — Company's 8 page bulletin "No. 1440" describes new "Type A5" centrifugal pump of volute type for horizontal or vertical installation. Engineering data includes dimensions diagram, charts of dimensional data, maximum feet of water suction lift. Fitting data chart for pipe size, and table of altitude, water temperature correction also given. *Dunham-Bush, Inc., Dept. HPAC,* 179 *South St., West Hartford* 10, *Conn.*

▶ *COAL-FIRED PACKAGE BOILERS* — Illustrated, 10 page bulletin "1100" describes series of bituminous coal-fired "Coal-Pak Automatic" package boilers. Units available for low or high pressure, hot water or steam systems, supplied with combustion controls, automatic coal feed, ash removal system. *International Boiler Works Co., Dept. HPAC,* 745 *Peach St., East Stroudsburg, Pa.*

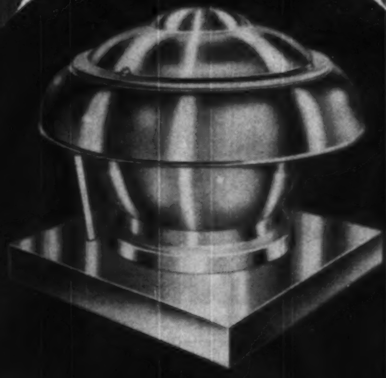
IMITATED...
BUT
NEVER DUPLICATED



Jenn-Air Quiet-Tested
Roof Exhauster



Typical Competitive
Unit



Jenn-Air Quiet-Tested
Centrifugal Roof Exhauster

ONLY JENN-AIR EXHAUSTERS OFFER TRUE LOW CONTOUR

The Big Difference is in the Installed Height

To conform with modern construction, low contour in exhausters is the accepted design among architects, engineers and building owners. And Jenn-Air, first to develop low contour spun aluminum exhausters, still engineers the lowest contour of all. Only true measurement of exhauster height is the distance from the roof level to the top of the exhauster. Jenn-Air Quiet-Tested units, when installed, stand 25 to 50% lower than others—yet meet specifications for a discharge height at least 16" above roof level. This is achieved by Jenn-Air's exclusive method of nesting the motor below the discharge of the exhauster. Thus, the base of the exhauster itself supplies the additional height. In competitive models, with a discharge height of only 9½", the curb base must be extended higher to attain the 16" position. Result: overall, installed height of competitive so-called "low contour" exhausters runs 8" to 10" more than that of Jenn-Air. Have a Jenn-Air representative show you the "yard-stick test" . . . proof positive that only Jenn-Air Quiet-Tested exhausters offer *true* low contour.

JENN-AIR PRODUCTS COMPANY, INC.
1102 Stadium Drive, Indianapolis 7, Indiana

YOU CAN *Profit* BY THE USE OF THESE *Practical* PRODUCTS OF GOODALL ENGINEERING . . .

Rubber EXPANSION JOINTS

Custom-built to meet specific requirements in sizes from ⅜" I.D. to 96" I.D., for pressures up to 125 lbs. P.S.I. and/or vacuum. Available in Right Angle Sleeve Types and "Flang-Lok"; single or multiple arch; tapered; offset; and rectangular.

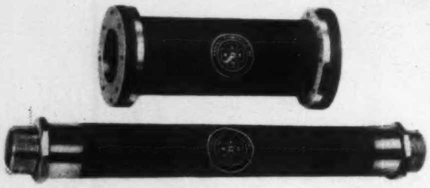
LONGER SERVICE LIFE. No deterioration through embrittlement or corrosion.

SENSITIVE RESPONSE TO PRESSURE. Only slightest pressure required to create movement in the joint, in any direction. Stress on metal pipe or other connected member reduced to absolute minimum.

EASIER TO INSTALL. Light in weight . . . short face-to-face dimensions . . . retaining rings or flanges quickly aligned and bolted. No gaskets required.

Rubber VIBRATION —SOUND ABSORBER UNITS

Economical for use in many installations in place of expansion joints, for effective control of vibration and noise emanating from water pipes, air conditioning, heating and ventilating equipment. Strong, durable, resilient rubber compound, with wear and weather-resistant cover. Plain or with built-in wire reinforcement. Furnished with I.P.T. ferrules or steel split connecting flanges. Sizes ½" to 12" I.D., in lengths from 12" to 48".



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FOR CORROSION CONTROL

"RUBBERHIDE" Linings are compounded to assure long-lasting protection against the particular corrosive agents involved. They will repay many times their cost through extended life of products, parts or equipment. Produced with either rubber or neoprene as the base material. Processed to objects shipped to our Linings Plants in Trenton, Chicago or Houston; or, when the objects are too large for such shipment, or the work involves fixed plant equipment, experienced field crews do the processing "on location".

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Standard of Quality—Since 1870

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BRANCHES AND DISTRIBUTORS THROUGHOUT THE UNITED STATES.
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RECENT TRADE LITERATURE

Continued

▶ *COILS AND BAFFLES* — Data on company's coil and baffle combinations is carried in bulletin "CB 276-C." Baffles now constructed from plastic-clad aluminum. Fifteen sizes in stock. Bulletin includes performance, dimension tables, technical dimensional illustrations, rapid selection table. *Kramer Trenton Co., Dept. HPAC, N. Olden and Breunig Aves., Trenton* 5, *N. J.*

▶ *COMMERCIAL WATER HEATERS* — Revised catalog covers manufacturer's line of water heaters. Seventeen models presented, with data on application, construction specifications, controls, hot water deliveries, space requirements. *Ruud Mfg. Co., Dept. HPAC, Kalamazoo, Mich.*

▶ *CONDENSING UNITS* — Bulletin "U-391" gives information on "Unicon" remote type air cooled condensers, intended for applications on tonnages without limit. Bulletin includes: rating tables of systems from 15 to 540 tons; dimensional information; drawings of typical installations; selection tables. *Kramer Trenton Co., Dept. HPAC, N. Olden and Breunig Aves., Trenton* 5, *N. J.*

▶ *CONVECTOR-AIR CONDITIONER* — Brochure available describing "Weather Twins" combined heater and Kelvinator air conditioner in single unit cabinet. *Embassy Steel Products,* 890 *Stanley Ave., Brooklyn.*

▶ *COOLING TOWERS* — Line of propeller fan cooling towers described in bulletin "EC-500." Belt drive, direct drive, take-apart models in capacities of 2 through 125 tons listed, shown. Bulletin gives rating data for selection under varying conditions. Detailed dimensions, diagrams included. Simplified diagram shows recommended piping for wintertime tower operation, with capacity, dimensional data for company's line of

Buensod pioneered and introduced proper controls for Dual-Duct Air Conditioning. Inherently, such systems have unstable pressures—yet provide the greatest flexibility of control for the occupants. So the problem was to make . . .

a STABLE dual-duct system

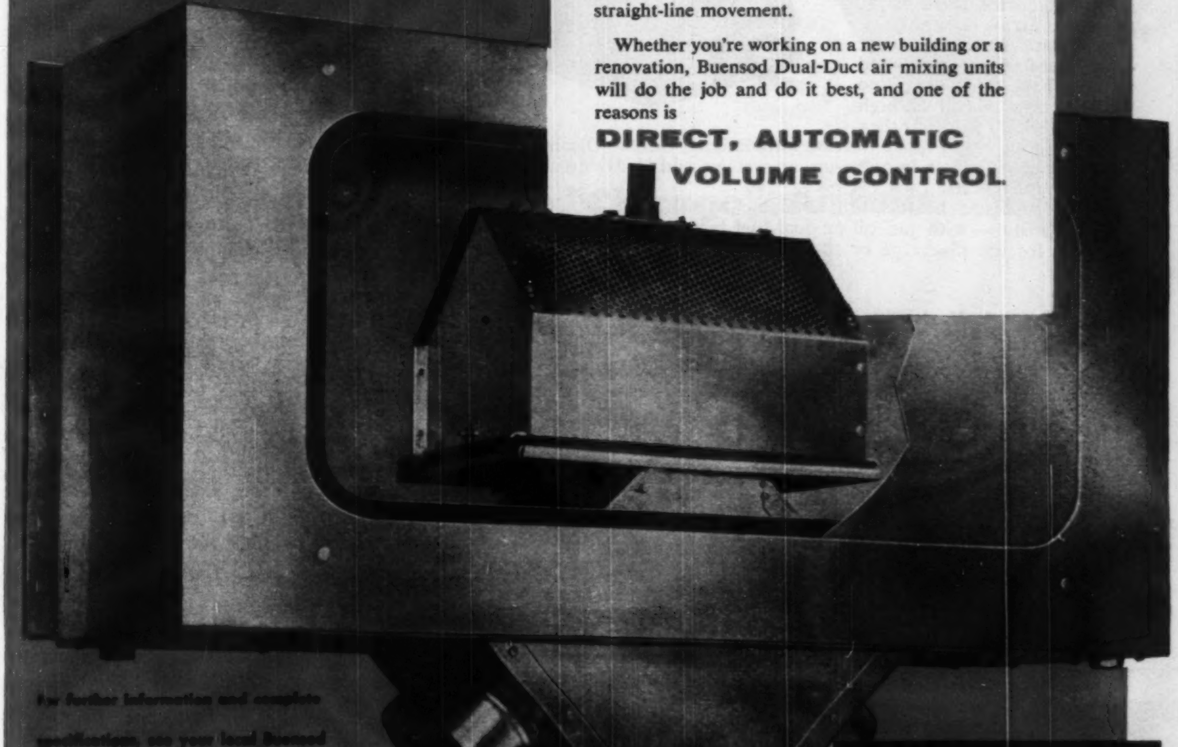
Buensod does it automatically and without a sensing instrument or complicated electronic device. This is DIRECT, AUTOMATIC VOLUME CONTROL. No matter what the variance in static pressures, a constant quantity of air is maintained in each unit. This makes it *impossible to unbalance any zone in the system.*

And it's so simple. A screw setting of spring tension at the time of installation and the unit need never be touched again. If after installation, a change of air volume in a particular zone is desired, it can be made quickly by adjusting one nut. When desired, volume adjustment can be pre-set at the factory by calibrated flow meters, eliminating the need for field adjustment. This, in effect, balances the entire system without necessity of a field check and re-balancing.

Compressed air from a local thermostat controls the mixing valve. No linkage. No pivot points. The valve has been designed for direct, straight-line movement.

Whether you're working on a new building or a renovation, Buensod Dual-Duct air mixing units will do the job and do it best, and one of the reasons is

DIRECT, AUTOMATIC VOLUME CONTROL.



For further information and complete specifications, see your local Buensod representative or contact us.

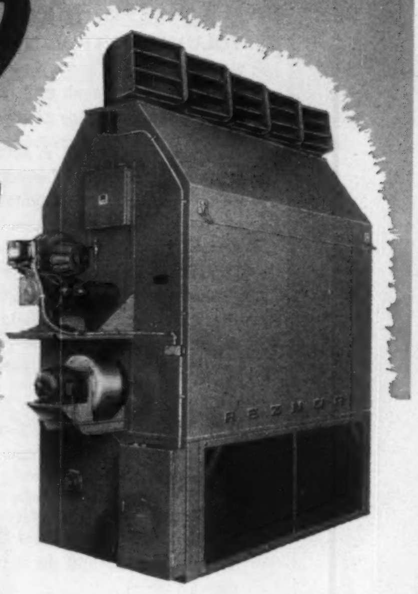
BUENSOD-STACEY, Inc.
45 West 18 Street, New York 11, N. Y

BUENSOD-STACEY
INCORPORATED

Here's the answer to your BIG SPACE HEATING PROBLEMS

Reznor-Olson

STAINLESS STEEL DIRECT FIRED HEATERS



These units are designed for heating factories, warehouses, garages, airplane hangars, gymnasiums and other large open areas. They pick cold air up off the floor, distribute heated air overhead at high velocity—either direct or thru ducts. In addition to space heating installations, Reznor-Olson heaters are well-suited for use in make-up air systems and in drying and other process applications.

Reznor-Olson heaters are available in ten sizes — 400,000 to 2,000,000 Btu — with gas, oil or dual-fuel burners. They may be floor mounted for top discharge or suspended for down-blast or horizontal discharge.

New Bulletin gives Complete Specifications

Complete specification information — including dimensions, control details, temperature rise, air delivery and fuel consumption — is included in a new bulletin, F-57A-RO. If you don't have a copy of this bulletin in your files, just fill out and mail the coupon below. Do it today.

Reznor Olson

REZNOR
WORLD'S LARGEST-SELLING DIRECT-FIRED
UNIT HEATERS

Reznor Manufacturing Company, 51 Union St., Mercer, Pa.

Please send me a copy of your bulletin F-57A-RO which gives complete specification data and construction details on Reznor-Olson direct fired heaters.

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Company________________________

Street________________________

City____________Zone______State__________

RECENT TRADE LITERATURE

Continued

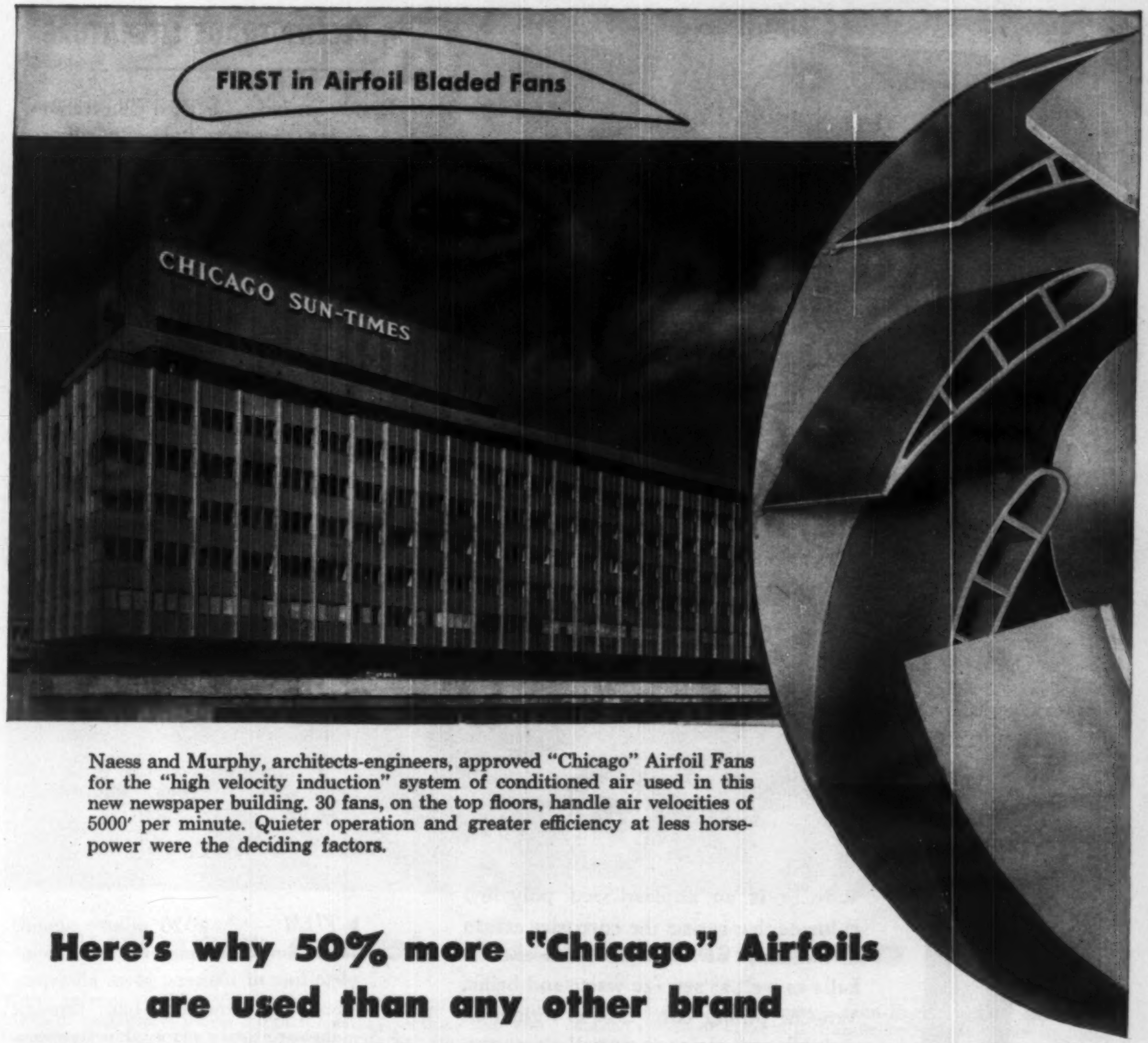
remote tanks. Tanks are for inside installation on applications requiring year 'round use. *Halstead & Mitchell, Dept. HPAC, Bessemer Bldg., Pittsburgh* 22.

▶ *CORK VIBRATION CONTROL* — Vibration, shock, noise controlling material discussed in bulletin. "Vibracork" recommended by company for massive, difficult to isolate machinery because it provides effective isolation of vibration, shock, noise by virtue of high resiliency, structural strength. Product available in two densities, three thicknesses. Standard sheet size is 12 × 36 in. Illustrations provided. *Korfund Co., Inc., Dept. HPAC,* 48-15 32*nd Pl., Long Island City* 1, *N. Y.*

▶ *DEWPOINT METER* — New, illustrated, 8 page bulletin "2051" describes company's "Dewpointer," which is said to use principle of varying pressure, rather than temperature, in determining dewpoints of any gas sample. Two new models have been added to line. Specifications given, with an explanation of operating principles. *Illinois Testing Laboratories, Inc., Dept. HPAC,* 420 *N. LaSalle St., Chicago* 10.

▶ *DUCTS AND FITTINGS* — Illustrated, 40 page catalog details line of "Seal-Tite" prefabricated ducts, fittings for heating, cooling. Indexed for reference, book identifies each fitting with part number, size, shipping weight, list price, complete specifications. Catalog includes charts, diagrams, engineering data on all types of cooling and forced air heating installations, says manufacturer. *Williamson Co., Dept. HPAC,* 3500 *Madison Rd., Cincinnati* 9.

▶ *ELECTRIC DUCT HEATERS* — Applications of electric blast coil heaters with duct installations outlined in bulletin "E-97U." Publica-


FIRST in Airfoil Bladed Fans
CHICAGO SUN-TIMES

Naess and Murphy, architects-engineers, approved "Chicago" Airfoil Fans for the "high velocity induction" system of conditioned air used in this new newspaper building. 30 fans, on the top floors, handle air velocities of 5000′ per minute. Quieter operation and greater efficiency at less horsepower were the deciding factors.

Here's why 50% more "Chicago" Airfoils are used than any other brand

Even *seven* years ago, when Chicago Blower first introduced them, engineers, contractors and architects recognized the superiority of "Chicago" Airfoil Bladed Centrifugal Fans. These are the reasons . . .

65% less noise
35% savings in h.p.
92% efficiency
all sizes and capacities

Since then thousands have been specified and are proving their superiority over conventional flat bladed fans in many varied installations.

General and heavy duty applications for . . .

- Air supply and exhaust
- Industrial processing
- Mechanical draft
- Building and tunnel ventilation
- High pressure and conventional ventilation

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☐ Send free 64-page Airfoil Centrifugal Catalog A-103 containing specifications, sizes, performances.

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LOOK at the Advantages of Van-Cor

PIPE, FITTINGS, VALVES

Van-Cor is an unplasticized polyvinyl chloride that resists the corrosive action of hundreds of industrial acids and alkalis as well as sewage waste and brine. Van-Cor piping costs less, is lighter in weight, and easier to install than conventional pipe. It is readily formed, machined, threaded and welded. Available in normal and high impact types. On many installations where metallic piping was eaten up *in a few months,* Van-Cor pipe has served *for years without deterioration.* Thus it quickly returns its cost and pays handsome dividends.

Van-Cor sheets are also fabricated into ducts, hoods, chemical tanks, fumestacks, etc.

Write for Catalog and Name of Nearest Distributor

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RECENT TRADE LITERATURE

Continued

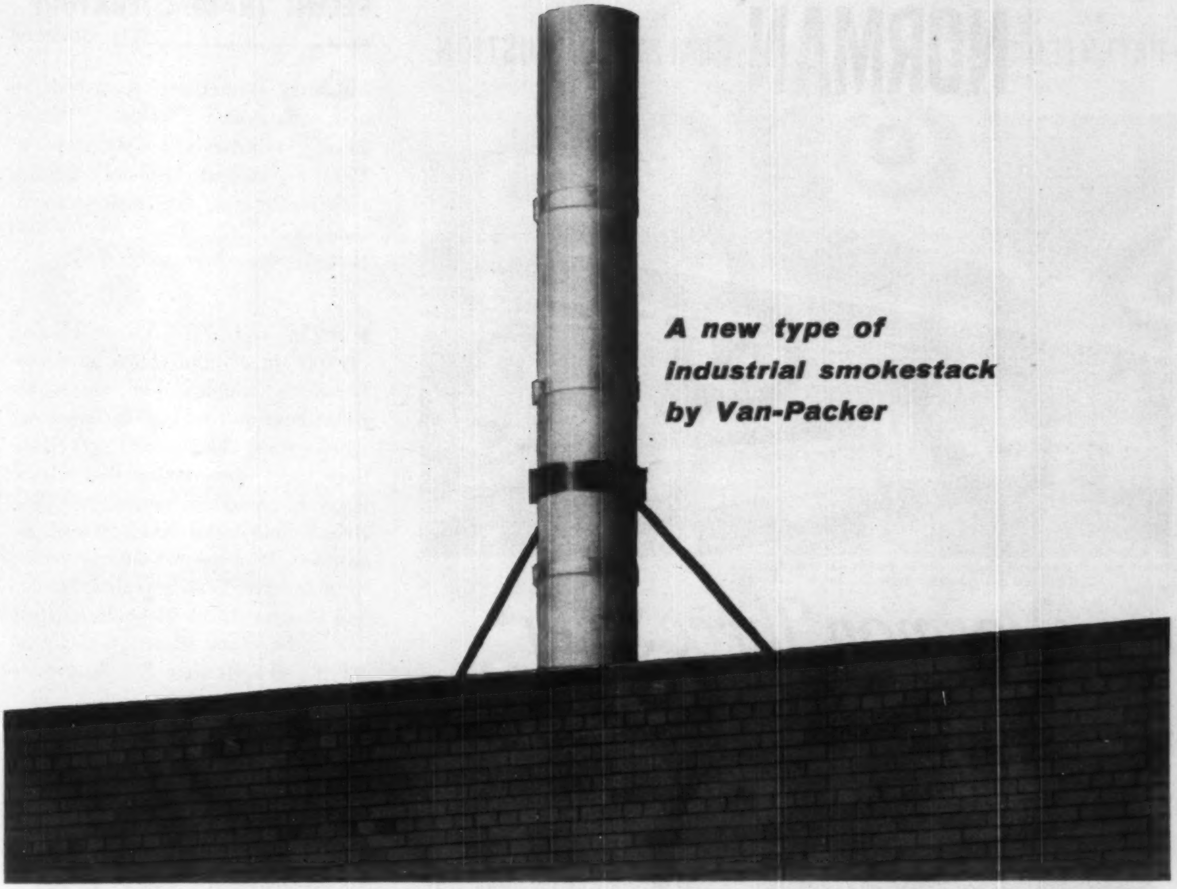
tion includes detailed illustrations, wiring diagrams, tables of dimensional data and specifications on heaters, accessories. *Industrial Engineering and Equipment Co., Dept. HPAC, 24 Hanley Industrial Ct., St. Louis* 17.

▶ *FILTERS FOR AIR, OIL, ETC.* — Illustrated catalogs describe, list 1958 line of filter equipment. "General Products Catalog," 16 pages, gives diagrams, dimensions, rated flows, etc. of oil, fuel, water filters, kits, lines, fittings, parts, brackets, gasket sets, etc. "Air Filter Catalog," 36 pages, includes comparative charts on engine wear with company's air filters, oil bath, oil wetted air cleaners. "Filter Specifications Catalog," 76 pages, gives oils and air filter cartridge cross reference, foreign vehicles cartridge cross reference, replacement cartridges for factory installed filters, other information. *Fram Corp., Dept. HPAC, Providence* 16, *R. I.*

▶ *FILM* — New 20 minute sound, color film shows manufacturer's complete line of blowers, gives all types, sizes. Film includes tour through company's main plant, shows process of converting raw steel into blower wheels, complete blower assemblies. Film produced in 16 mm size. *Lau Blower Co., Dept. HPAC,* 2027 *Home Ave., Dayton* 7.

▶ *GAS AND OIL BURNER SYSTEMS* — Catalog changes in manufacturer's line of gas and oil burner systems are given in series of bulletin sheets now available. *Mettler Co., Inc., Div. of Eclipse Fuel Engineering Co., Dept. HPAC,* 4366 *Worth St., Los Angeles* 63.

▶ *HIGH TEMPERATURE INSULATION* — Characteristics, specifications of "Mono-Block" and "Improved Super Powerhouse Cement," high temperature spun mineral wool



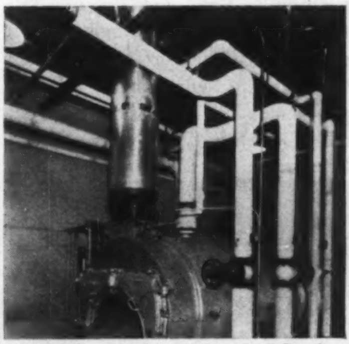
Outlasts steel stacks, costs no more

Won't corrode — The Van-Packer industrial smokestack is made of centrifugally-cast 3-foot refractory sections that will far outlast a steel stack. An aluminum jacket encases each section and eliminates maintenance.

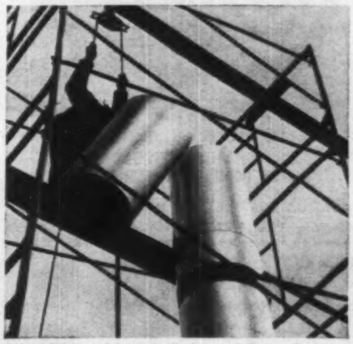
Economical — The Van-Packer costs no more than a steel stack; 2/3rds less than a brick stack. Easy installation, savings on maintenance, and long life results in further savings. Provides high draft equal to that of a comparable brick stack.

For boilers or incinerators — Van-Packer stacks can be installed inside or outside to handle boilers, furnaces or incinerators. Comes in seven diameters from 10-inch ID to 30-inch ID. Handles all fuels.

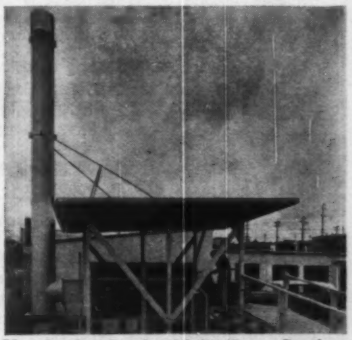
Available nationwide—Van-Packer Stack is available through local Van-Packer Jobbers and Special Representatives. See "Chimneys — Prefabricated" in Yellow Pages, or write Van-Packer for Bulletin IS-32.57.



Van-Packer Stack with Standard Sections handles boilers and furnaces efficiently. Can be superimposed or floor supported.



Installing this stack is quick and easy. Three-foot sections are simply cemented atop one another with acidproof cement.



Van-Packer Stack with Hi-Temp Sections handles industrial incinerators with continuous flue gas temperatures of 2000° F.

Van-Packer PREFABRICATED REFRACTORY **Stack**

Van-Packer Company • Division of The Flintkote Company
P. O. Box No. 306, Bettendorf, Iowa • Phone: East Moline, Ill. 3-5288

S Sweet's

PATENTED **NORMAN** SEALED COMBUSTION

Radial-Flo application in Cadillac Super Market, Oxford, Michigan
Constructed and Operated by H. D. Grove

Norman Three-Sixty®

Gas-Fired **UNIT HEATERS**

answer more jobs better

Operating completely independent of room air, Norman Three-Sixty Unit Heaters can be installed in many applications where other unit heaters may fail.

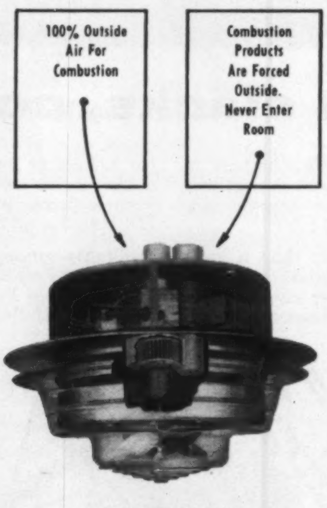
They are especially suitable for super markets, bakeries, restaurants, meat shops, candy stores and other locations where combustion products entering the room threaten contamination.

Norman Three-Sixty Unit Heaters are particularly adaptable to drug stores, variety stores, dry cleaners or wherever exhaust fans create a negative pressure that may cause pilot outage.

Two Types, Two Sizes

Radial-Flo units gently distribute a complete circle of warm air downward and outward. Down-Blo units provide direct, spot heating from high ceilings—excellent for blanketing vestibules, lobbies and doorways of garages, repair shops, warehouses and other entries exposed frequently to the outside weather.

Both Radial-Flo and Down-Blow models available in 85,000 or 115,000 BTU/hr. inputs.


100% Outside Air For Combustion
Combustion Products Are Forced Outside. Never Enter Room

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IN CANADA: A. D. PALMER PRODUCTS LTD., Lethbridge, Alberta — A. D. PALMER & CO., Port Credit, Ontario

Norman® products company

NORMAN PRODUCTS CO.
1156 Chesapeake Ave., Columbus 12, Ohio
We want to learn more about Norman Three-Sixty Unit Heaters.

NAME__________
COMPANY NAME__________
ADDRESS__________
CITY__________ZONE____STATE__________

See Sweet's Arch. File 30C/No, American Sch. and Univ. Annual C-1/No

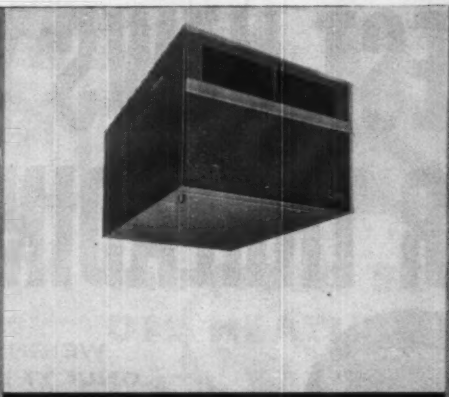
insulating materials, described in new, illustrated booklet. "Mono-Block" withstands temperatures to 1700 F; cement insulates, finishes with single coat, says manufacturer. *Baldwin-Hill Co., Dept. HPAC, 500 Breunig Ave., Trenton 2, N. J.*

▶ *HOSE AND TUBING* — Catalog "G-560" gives information on manufacturer's complete line of flexible metal hose and tubing. Included are types, sizes, engineering specifications, uses, construction and advantages of seamless, corrugated and strip wound metal hose, fittings, assemblies. Dimensional data presented in table form. Catalog is diagrammed and illustrated. *American Metal Hose Div., American Brass Co., Dept. HPAC, 414 Meadow St., Waterbury 20, Conn.*

▶ *HOT WATER HEATERS* — Data list gives engineering information on company's line of hot water heaters with copper, "Corro-Shield," hydraulic cement lined tanks. Diagrammed and illustrated, dimensional tables also included. *Sims Co., Inc., Dept. HPAC, Box 1096 DC, Erie, Pa.*

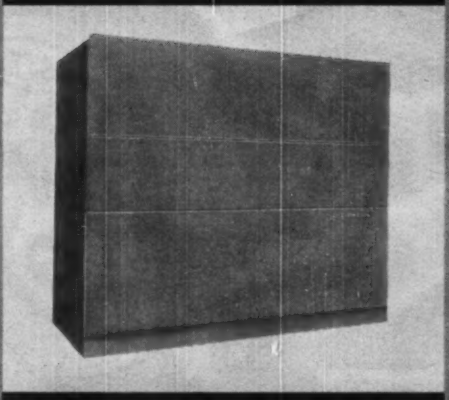
▶ *HUMIDISTAT* — Automatic control for dehumidifiers and humidifiers in two models described in new publication. "Model 80" is designed for dehumidifiers, "Model 82" for humidifiers. Both operate on 115 volts, 60 cycles, a-c single phase. Units are available for wall mounting or as built-in controller for original equipment. *Friez Instrument Div., Bendix Aviation Corp., Dept. HPAC, 1400 Taylor Ave., Baltimore 4.*

▶ *INSULATED PIPING SYSTEMS* — Revised product catalog covers construction features for prefabricated systems for steam, hot water, oil or refrigeration distribution lines. Types of systems discussed: "Helcor," "Uniline," "Type J," low temperature, cast iron. Prefabricated accessories: expansion loops, elbows,



5 & 7½ TON CEILING MOUNTED UNITS

The most compact unit of its size in the industry. Horizontal water cooled unit installs anywhere, frees all floor space. Small parts can be replaced on job. One man can remove compressor from ceiling location without disconnecting ducts or removing unit. All copper condenser, sealed fan bearings, high capacity ratings.



50 & 60 TON SELF CONTAINED

Compact as a packaged unit, flexible as a central station system. Self contained, all piped, wired, factory assembled. Rugged construction. High static pressure availability for long duct runs. Heavy duty fans with lifetime sealed bearings that never need oiling.

YOU KNOW YOU CAN COUNT ON TYPHOON!

Typhoon adds to your reputation by turning in the kind of performance your clients demand . . . and more! Each and every Typhoon unit is designed and built to stand up to extreme weather conditions and sudden severe temperature changes without strain or breakdown. Typhoon quality begins with Power Reserve—superior components and oversize parts to deliver beyond rated capacity. All copper condensers in water cooled units, largest coil surfaces, and rugged 11 and 14 gauge metal in durable lifetime cabinets. And Typhoon dependability is enhanced by the flexibility of large and small units that can be easily adapted, split or combined to fit any and all installations with maximum ease and economy. Air cooled units from 2 tons to 20 tons, both packaged and as split systems. Water cooled units from 3 tons to 60 tons. Packaged water chillers, 2 tons to 50 tons. Air cooled condensing units to 20 tons, water cooled to 60 tons. For quality, performance, versatility . . . next time specify Typhoon, the industry's most complete line of packaged air conditioners.

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Typhoon Air Conditioning Company
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8E-8

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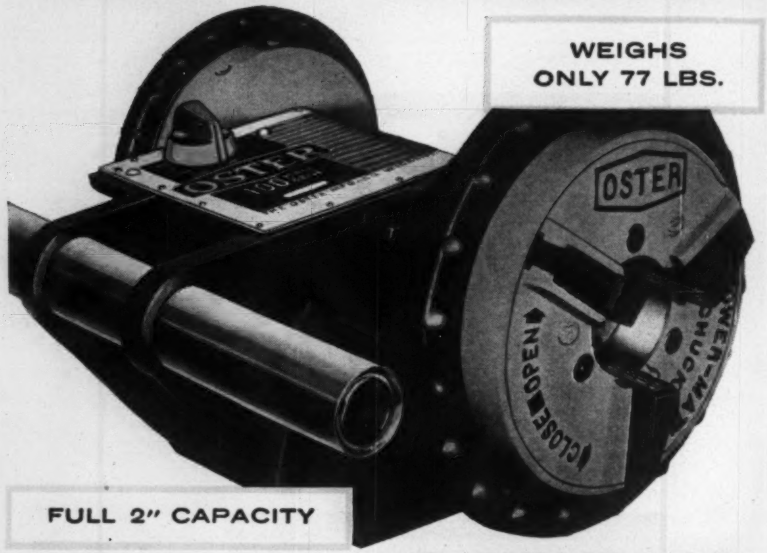

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lowest price in the industry...for the all-new OSTER

"100" POWER PIPE MACHINE

. . . complete with NEW "POWER-MATIC" FRONT CHUCK including REPLACEABLE INSERT CHUCK JAWS . . . SELF-CENTERING REAR CHUCK . . . POWERFUL HEAVY-DUTY REVERSIBLE MOTOR.

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Builders of the World's Most Complete Line of Threading Equipment

For other Models write for General Catalog

THE OSTER MANUFACTURING COMPANY • 1347 East 289th St., Wickliffe, Ohio

RECENT TRADE LITERATURE

Continued

gland seals, tees. Details for field connections included; specifications given. *Ric-wiL, Inc., Dept. HPAC, Barberton, Ohio.*

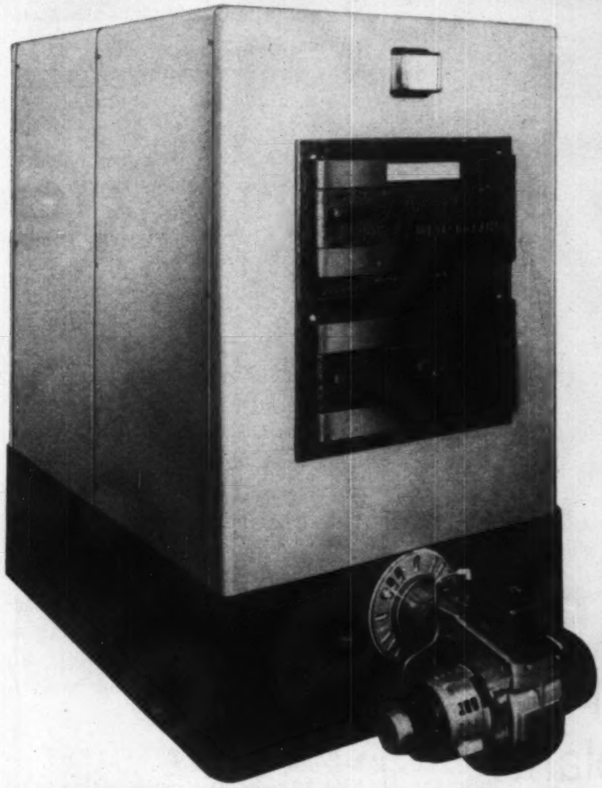
▶ *INSULATION BOARD* — Folder outlines specifications, applications of company's line of fireproof insulation board, which is said to be as workable as wood. Composition, characteristics of this inorganic material also described. *North American Asbestos, Dept. HPAC, Room* 3210, *Board of Trade Bldg., Chicago* 4.

▶ *LOW TEMPERATURE INSULATION* — Reference file folder describes "Uni-Crest" expanded polystyrene insulation material. Features cited: low thermal conductivity; resistance to water and water vapor; light weight; resistance to fungus, rot, vermin. Folder contains specification sheets for applications to variety of perimeter, foundation, concrete slab insulation problems. Illustrated with sectional drawings. *Uni-Crest Div., United Cork Cos., Dept. HPAC, Central Ave. and Bay St., Kearney, N. J.*

▶ *OIL HEATER* — Brochure gives details of manufacturer's forced circulation "Peak-Temp" oil heater, designed for high temperature, low pressure heating of asphalt, heavy oils, concrete. Unit heats, circulates heat transfer oils to 450 F through closed system. Produced in oil, gas and combination oil/gas fired models: 1,800,000 Btu per hr, 3 million Btu per hr input. *Cleaver-Brooks Co., Dept. HPAC,* 326 *E. Keefe Ave., Milwaukee* 12.

▶ *PIPE, FITTINGS*—"Luzerne" polyvinyl chloride pipe, fittings described in new 8 page bulletin "PF 1200." Features cited: lightness in weight, ease of installation, ruggedness. *Luzerne Rubber Co., Dept. HPAC, Trenton, N. J.*

ANNOUNCING THE
WEIL-McLAIN No. 82



OIL FIRED BOILER AND OIL HEATING UNIT

I=B=R tested and rated for capacities of 1300-3260 sq. ft. steam and 2255-5290 sq. ft. water

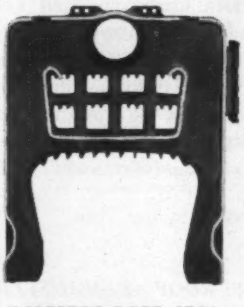
A genuine advance in boiler design...offering new features for operating economy, easy maintenance, simplified erection and long life!

The No. 82 Boiler incorporates the self-regulating, turn-around principle of flue gas travel developed by Weil-McLain engineers for increased heat transfer and greater fuel economy.

Other features include a new asbestos rope seal...a pre-cast refractory combustion chamber designed to properly develop the full heat potential of the burner flame...an electronic safety control to prove the flame in No. 82 Boilers burning 7 GPH and up...top clean-out plates for easy access to all surfaces...and short draw rods which simplify erection and assure a strain-free boiler assembly.

PROVISION FOR SINGLE OR DUAL WATER HEATERS

The Weil-McLain No. 82 Boiler has a unique and exclusive method of installing tankless water heaters. The diagram below shows how either single or dual heaters can be employed. The fin tube heater itself is a highly efficient unit of large capacity.



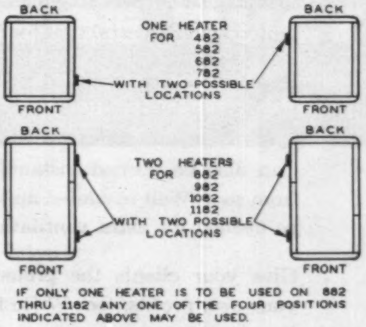
ASBESTOS ROPE SEAL

Exclusive! Asbestos rope inserts in grooved seal strip in boiler sections. Compressible—won't crack or squeeze out...remains gas-tight during life of the boiler.

SELF-REGULATING FLUE GAS TRAVEL

Ingenious design of sections breaks flue gases into multiple streams which contact all heating surfaces to top of sections...greatly increases heat transfer.

TANKLESS WATER HEATER


BACK
ONE HEATER FOR 482 582 682 782
WITH TWO POSSIBLE LOCATIONS
FRONT
BACK
FRONT
BACK
TWO HEATERS FOR 882 982 1082 1182
WITH TWO POSSIBLE LOCATIONS
FRONT
BACK
FRONT

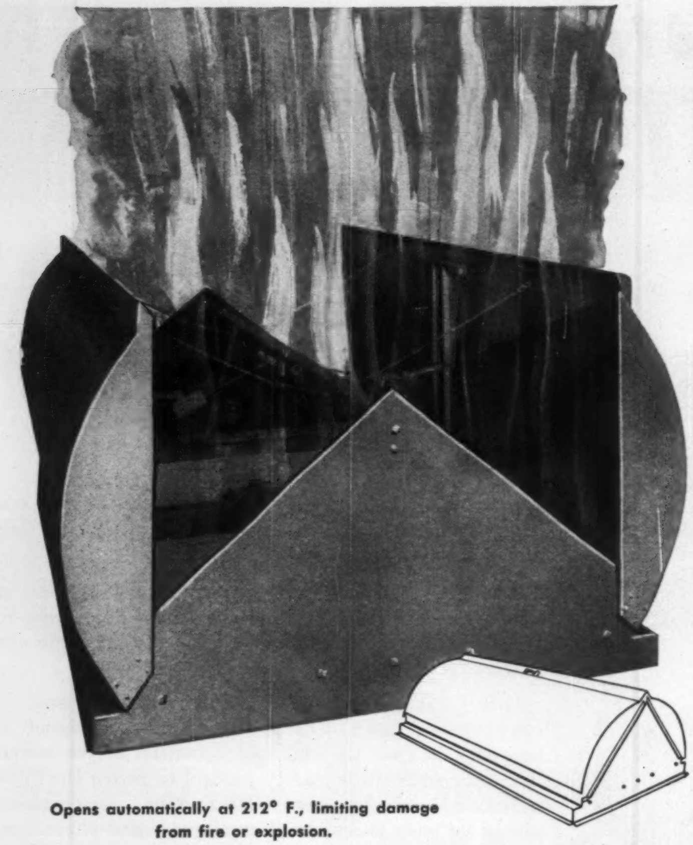
IF ONLY ONE HEATER IS TO BE USED ON 882 THRU 1182 ANY ONE OF THE FOUR POSITIONS INDICATED ABOVE MAY BE USED.

Send for bulletin giving complete description and engineering data

WEIL-McLAIN
BOILERS · RADIATORS

WEIL-McLAIN COMPANY
MICHIGAN CITY, INDIANA

Address literature requests to Dept. AA-58



Opens automatically at 212° F., limiting damage from fire or explosion.

It's cheaper to burn up
the sky than a plant!

When fire or explosion strikes a plant, Swartwout Pyrojectors open automatically . . . eject heat, flames, smoke through the roof instead of spreading them across the building. Pyrojector protection gives extra time for fire fighting equipment to arrive.

Pyrojectors are installed and operate entirely above roof level, yet extend only 28″ above curb. Fusible link mechanism opens 28 square foot vent when temperature reaches 212° F. Can also be opened instantaneously with release chain or from roof. Well insulated and weather tight, Pyrojectors can be opened for extra ventilation in summer.

Give your clients the protection they need, and increase your own profits, too. Write for complete information about Pyrojectors today.

The Swartwout Co.
Ventilation Engineering
18568 Euclid Avenue Cleveland 12, Ohio

RECENT TRADE LITERATURE

Continued

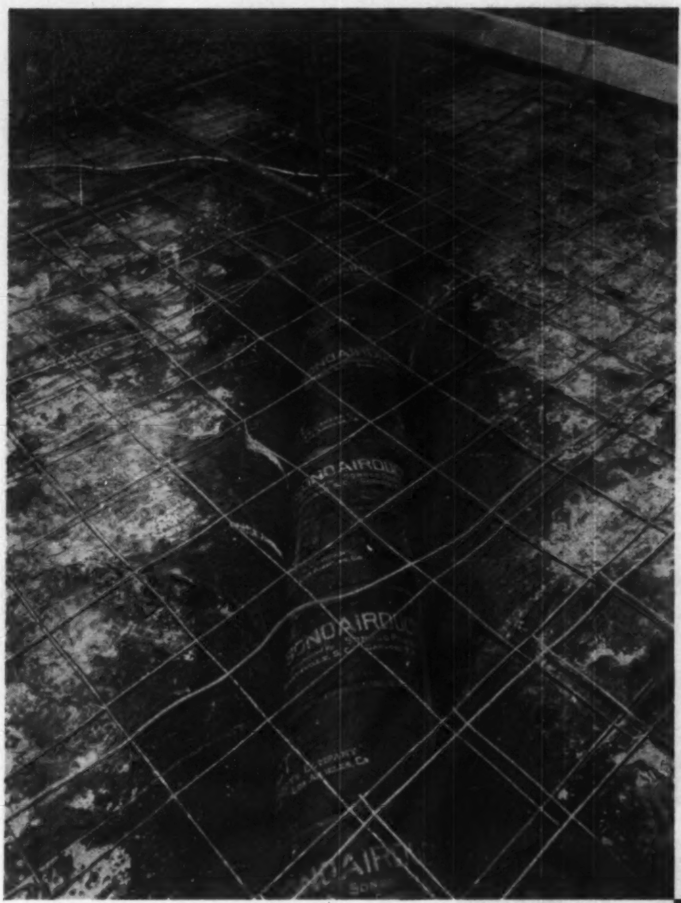
▸ *PIPING, FITTINGS* — New 48 page bulletin "FB-77" summarizes, correlates various specifications of ASA Code for Pressure Piping, and ASME Boiler and Pressure Vessel Code. With bulletin's tabular matter, determination of following requirements possible: minimum wall or maximum pressure; minimum pressure-stress ratios; maximum allowable working pressure; maximum allowable stress; nominal wall thickness. *Babcock & Wilcox Co., Tubular Products Div., Dept. HPAC, Beaver Falls, Pa.*

▸ *PIPE INSULATION* — New bulletin issued by manufacturer tells of "No. 101," a high temperature mineral wool material, designed for application around pipes with temperatures to 1200 F and 4 to 30 in. diam. Thermal conductivities for entire range of recommended temperatures presented in tabular form. Illustrated application instructions, suggested engineering specifications provided. *Baldwin-Hill Co., Dept. HPAC,* 500 *Breunig Ave., Trenton* 2, *N. J.*

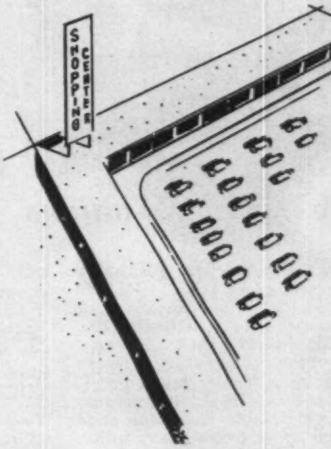
▸ *PLASTIC DUCT SYSTEMS* — New 12 page illustrated catalog titled "Thermoplastic Corrosion-Proof Ventilating and Exhaust Systems" presents details, necessary components for designing polyethylene duct systems. Information on specific components, fittings arranged for reference in catalog. *American Agile Corp., Dept. HPAC, P. O. Box* 168, *Bedford, Ohio.*

▸ *POWER ROOF EXHAUSTERS* — New 8 page catalog describes manufacturer's line of direct connected power roof exhausters. Data covers features, performance, installation, material specifications. *Gallaher Co., Dept. HPAC,* 4108 *Dodge St., Omaha.*

▸ *POWER ROOF VENTILATORS* — Bulletin "No. 2700" covers company's line of airfoil centrifugal venti-



Up your profits –



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SONOAIRDUCT®

FIBRE DUCT

for slab perimeter heating or combination heating and cooling systems!

Profits go up when you install SONOCO Sonoairduct because you save time, labor and money. No other duct installs as fast and as easily as Sonoairduct. Available in 23 sizes—2″ to 36″ I.D., with the larger diameters particularly well suited as supply and return lines for shopping centers, schools, churches and industrial heating and cooling systems.

Sonoairduct is widely used and approved by contractors. Meets and exceeds F.H.A. criteria and test requirements for products in this category. Aluminum foil lined. Made in specified lengths up to 50′ long, and can be sawed to exact lengths on the job. Free installation manual available. See our catalog in Sweet's.

For complete information and prices, write

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1349

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to give
drip-tight
leak-proof
seal

greate unions **DART**

For over 55 years the firm guarantee back of each and every DART UNION sold has been — *"if one should leak through we will give you two"!* The record reveals that less than 1 in every 100,000 has proven to be faulty. The extra wide bronze to bronze seats, precision ground to a true ball joint, mounted in heavy malleable iron pipe ends and protected by an extra heavy union nut, make a drip-tight, leak-proof connection WITHOUT EXCESSIVE WRENCHING time and time again.

Guarantee positive tight connections and extra long service on your pipe lines by using the DART GUARANTEED UNION.

Yours on request: Descriptive brochure on Dart Unions and Union Fittings.

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DRY and CLEAN AIR at the RIGHT TEMPERATURE

- to control your product quality
- to protect a critical operation
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- to DRY your material or product
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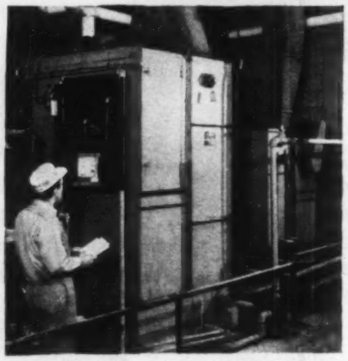
- to assure precision in testing or research
- to increase air conditioning capacity

Air Condition by the NIAGARA Method Using HYGROL Liquid Absorbent



This compact method, giving high capacity in small space, removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the air.

Most effective because... it removes moisture as a separate function from cooling or heating and so gives a precise result, and always. Niagara machines using liquid contact means of drying air have given over 20 years of service. The apparatus is simple, parts are accessible, controls are trustworthy.

Most reliable because...the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions... no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.

Most flexible because...you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

Write for Bulletins 112 and 131 and complete information on your air conditioning problem.

NIAGARA BLOWER COMPANY
Dept. HP-5, 405 Lexington Ave., New York 17, N.Y.
Niagara District Engineers in Principal Cities of U. S. and Canada

RECENT TRADE LITERATURE

Continued

lators. Full details given on recently introduced backward curved design blade. Capacity ratings, noise level classifications, motor-selection specifications, installation notes, descriptions of range of accessories included. Illustrated, diagrammed, with full dimensional data. *Ilg Electric Ventilating Co., Dept. HPAC,* 2850 *N. Pulaski Rd., Chicago* 41.

▶ *PROCESS PUMPS* — Illustrated, 8 page booklet "EM-79" discusses radial loads, their cause, measurement, effect on manufacturer's pumps. "Mechanical Considerations in Pump Design" covers cause, effect, cure of damaging radial thrust forces on process pump impellers, bearings, wear rings, seals and stuffing boxes, shaft itself. Formula, diagrams, text explain production applications of findings. *Peerless Pump Div., Food Machinery and Chemical Corp., Dept. HPAC,* 301 *West Ave.* 26, *Los Angeles* 31.

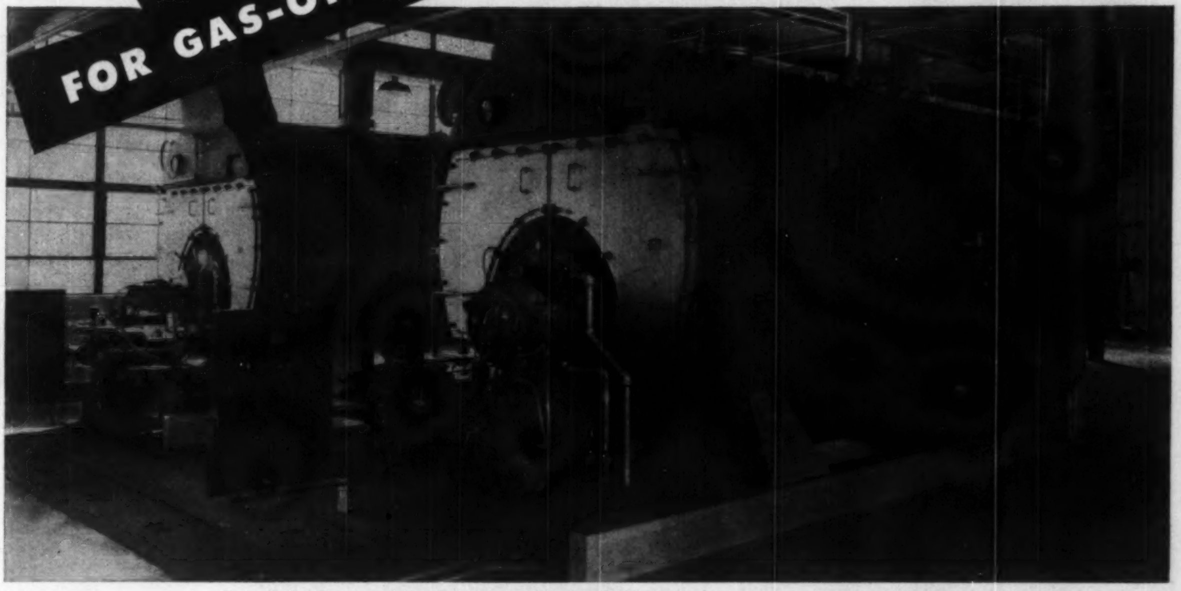
▶ *PULL TOOLS* — Illustrated, 6 page catalog "Form 8-421" describes company's line of standard pneumatic tools for fastener installation. Catalog lists nomenclature, describes each of five basic units available from manufacturer. Table provided for determination of fastener to be installed with each tool. *Huck Mfg. Co., Dept. HPAC,* 2480 *Bellevue Ave., Detroit.*

▶ *PUMPS* — Application engineering data sheet "E-57-3" covers application of "Constametric miniPumps" in core analysis. Data sheet explains background, problems encountered in determining permeability and porosity data, explains how product is intended to maintain required pressures without pulsations for data evaluation of liquid-flow characteristics of low permeability rock samples. Data sheet "F-57-1" describes method of enriching industrial wastes to provide diet for bacteria that destroy pollutants. Details of

FOR GAS

FOR OIL

FOR GAS-OIL COMBINATION



Petro Boiler-Burner unit installation at the Lambert-St. Louis Municipal Airport, St. Louis, Missouri

Here in one complete package . . . is the PETRO FORCED DRAFT FIRING SYSTEM

Available as a complete boiler-burner unit. The Petro firing unit, integrated with matched Scotch boiler (as shown above), is a complete boiler-burner unit. Installation consists of little more than attaching fuel and power lines. No pitted boiler settings; no high stacks; no separate air supply; no panel wiring. It is a thoroughly engineered unit, factory tested, with all vital components matched and mounted on a single base.

Available as a burner unit only . . . will fit any boiler. Petro firing units can be applied to any boiler. The entire system is factory-built, wired and tested. Everything needed for ultra modern firing is mounted on a rigid steel frame ready to bolt to the boiler front. Integrated air system makes the usual firing arch, firebox pit and brick checker floor unnecessary.

Saves installation costs. Whether you buy the complete boiler-burner unit or install the Petro forced draft firing system in your present boiler, you save time and money and avoid several local contracts. The job is backed by factory responsibility. All the needed component parts have been engineered and installed as a working unit fitted to specific boiler and fuel requirements . . . it's ready to render peak service from the very start.

No stack needed. Petro forced draft firing units eliminate high stacks. In fact, the only flue connection necessary is to a simple vent for the spent products of combustion. Unlike induced draft systems, the Petro blower operates in clean, relatively cool air. No maintenance problems arise from overheated bearings or corrosive gases. Power consumption is cut, too, for with the contracted volume of cool air, a motor only about one-half as large as that used with induced draft burners is required.

Switches fuels quickly. The combination gas-and-oil firing system embodies distinct advantages of continuous operation. Alternate fuels may be introduced in as little as 60 seconds. No extended shutdown of equipment. Controls for completely automatic changeover of fuels are also available.

For more information please mail the coupon.

See Petro Catalog in Sweet's Architectural File

PETRO

T. M. REG. U. S. PAT. OFF.

HEATING AND POWER EQUIPMENT

PETRO, 3233 West 106th Street, Cleveland 11, Ohio.
(In Canada, write to 80 Ward Street, Toronto, Ontario)

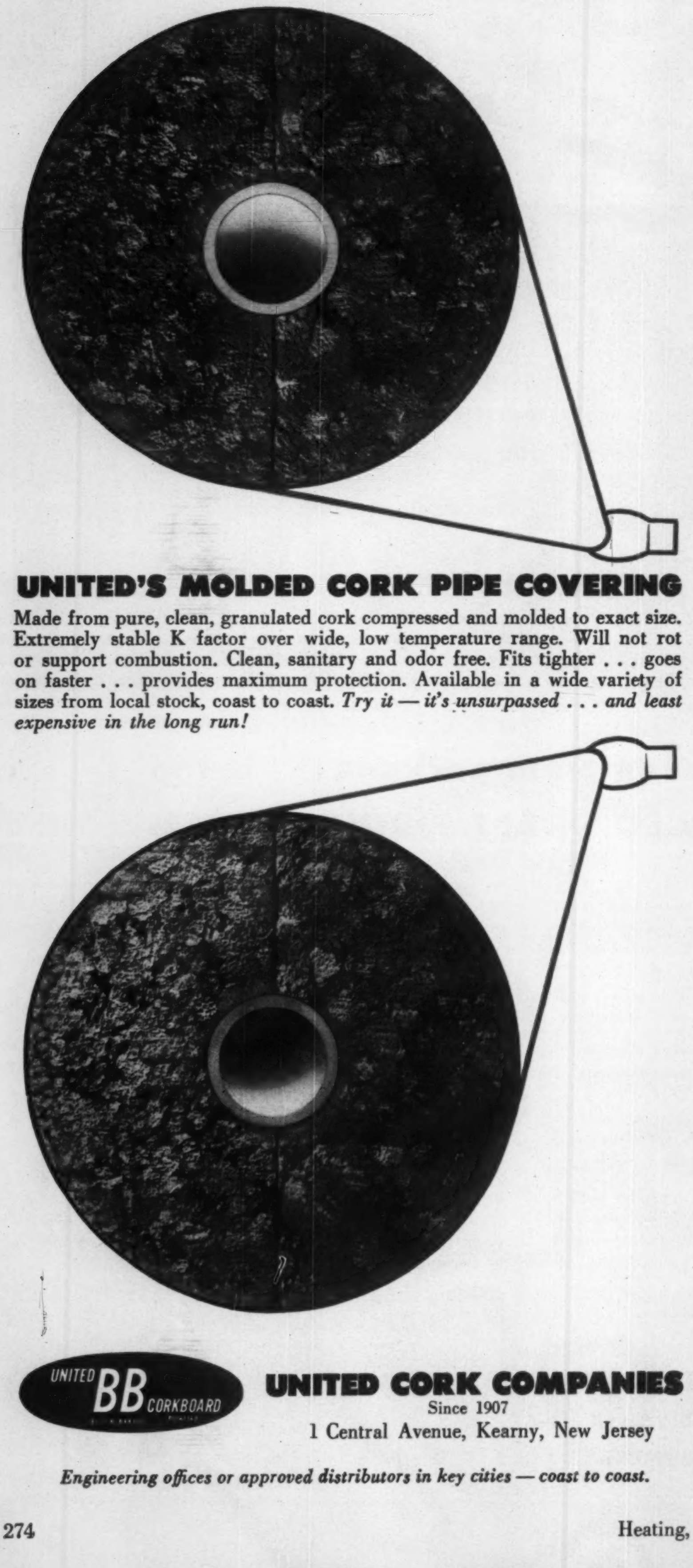
Please send catalog and specifications on Petro gas and oil firing units.

Name____________________

Company____________________

Address____________________

City__________ Zone____ State______



UNITED'S MOLDED CORK PIPE COVERING

Made from pure, clean, granulated cork compressed and molded to exact size. Extremely stable K factor over wide, low temperature range. Will not rot or support combustion. Clean, sanitary and odor free. Fits tighter . . . goes on faster . . . provides maximum protection. Available in a wide variety of sizes from local stock, coast to coast. *Try it — it's unsurpassed . . . and least expensive in the long run!*

UNITED BB CORKBOARD

UNITED CORK COMPANIES
Since 1907
1 Central Avenue, Kearny, New Jersey

Engineering offices or approved distributors in key cities — coast to coast.

RECENT TRADE LITERATURE

Continued

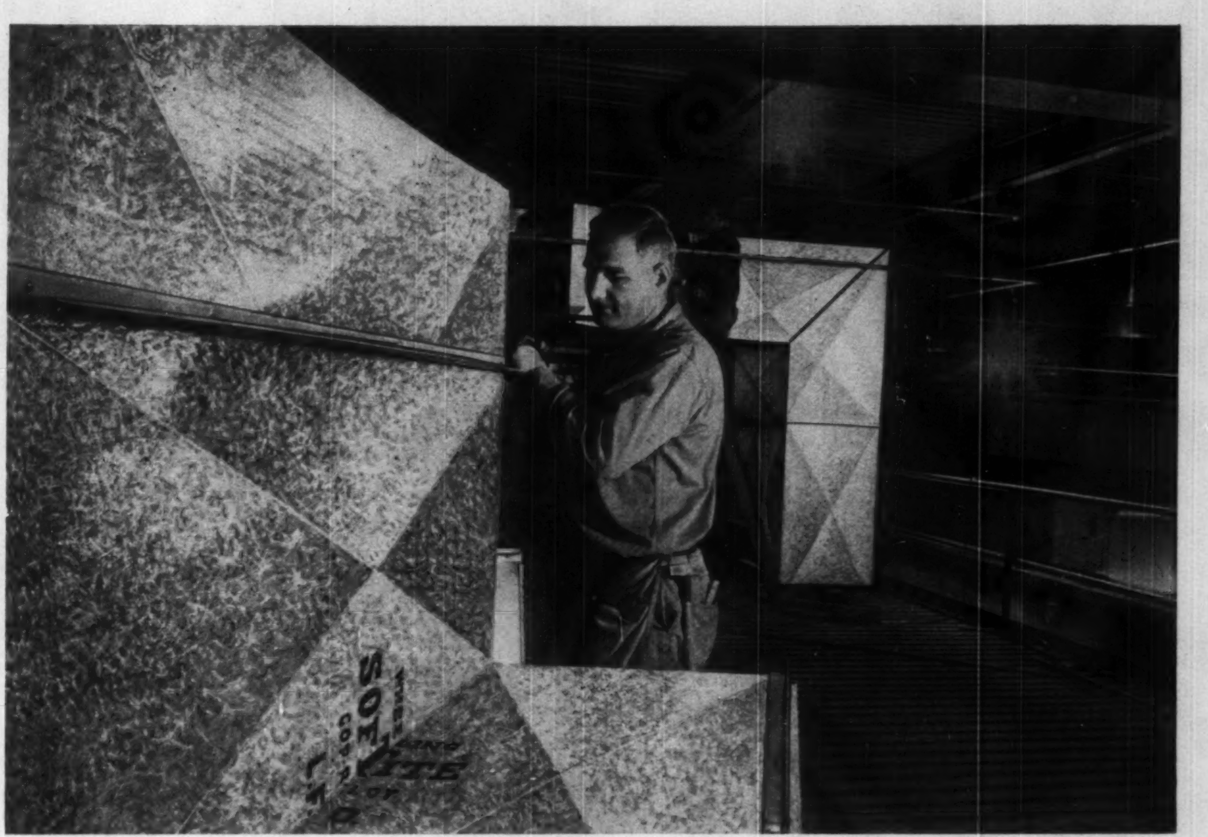
pumps needed for feeding aqueous ammonia, phosphoric acid given. *Milton Roy Co., Dept. HPAC,* 1300 *E. Mermaid Lane, Philadelphia* 18.

▶ *PULSE GENERATOR* — Data Sheet "E-57-2" outlines use of company's line of pulse generators to recirculate gases for reforming and hydrogeneration processes in multiple-purpose pilot plants. Four page, illustrated publication includes specifications, ranges, reference charts, diagrams covering product. *Milton Roy Co., Dept. HPAC,* 1300 *E. Mermaid Lane, Philadelphia* 18.

▶ *SCALE REMOVING TREATMENT*—Folder of 10 case history reports outlines use of company's scale removing water treatment product. Problems encountered in water using equipment are given, together with scale removing procedure, results achieved. Product is granular, nontoxic; especially recommended for heat transfer surfaces, says company. *North American Mogul Products Co., Dept. HPAC, Standard Bldg., Cleveland* 13.

▶ *SCHOOL HEATING, VENTILATING* — New manual presents school heating and ventilating requirements, shows how manufacturer's line is designed to meet these needs. Warm air, perimeter system described in detail. Architectural, mechanical specification data, engineering drawings also included. *Norman Products Co., Dept. HPAC,* 1150 *Chesapeake Ave., Columbus, Ohio.*

▶ *STAINLESS STEEL FITTINGS* — Eight page catalog "50.0" describes uses of company's line of "Quikupl" stainless steel fittings. Fittings designed for light wall tubing, also furnished for OD, IPS size. Elbows, tees, couplings, reducers, adapters from 1 to 4 in. available in stainless steel alloys 304, 316. Book-



Operator: *Pratt & Whitney Division, United Aircraft Corp., Hartford, Conn.* **General Contractor:** *Davidson Construction Company, Manchester, New Hampshire.* **Heating Contractor:** *C. N. Flagg Company, Meriden, Conn.* **Sheet Metal Contractor:** *G. R. Cummings Company, Meriden, Conn.*

Wheeling SOFTITE Galvanized Sheets selected for Connecticut Aircraft Nuclear Engine Laboratories installation

SOFTITE *used in this project included 20 and 22 gage sheets for supply lines; 24 and 26 gage for interior room ducts.*

A major installation at the U.S. Air Force's highly secret Connecticut Aircraft Nuclear Engine Laboratories, Middletown, Connecticut, has a single duct system that required over 65 tons of Wheeling SOFTITE® Cop-R-Loy® Galvanized Sheets.

According to G. R. Cummings Company, sheet metal fabricators on the job, SOFTITE was selected because the ductwork was to be left exposed and "SOFTITE's uniform, attractive coating improved the appearance of the job."

What's more, SOFTITE affords many other important advantages. For example, it can be bent and hammered into seams that require double folds in fraction-of-an-inch areas without danger of flaking.

And long service under adverse conditions is assured by the use of Cop-R-Loy—Wheeling's famous long-lived copper-bearing steel.

Find out how SOFTITE can help you from our nearest sales office or distributor. Wheeling Steel Corporation, Wheeling, West Virginia. **IT'S WHEELING STEEL**

WHEELING STEEL

OUR CHALLENGE STILL STANDS: ANYTHING THAT CAN BE MADE OF STEEL SHEETS CAN BE MADE OF WHEELING SOFTITE GALVANIZED STEEL SHEETS.

District Sales Offices at Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Houston, New York, Philadelphia, St. Louis, San Francisco, Wheeling

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FANS

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cooling
tower
efficiency
with
MORE CFM
and LESS HP

Precision engineered Aeromaster Fans with variable pitch blades and anti-flutter design give cooling at *lower cost.* Blades resist acids, alkalies, abrasion and weather. 4, 6 or 8 blade styles in 54″ to 22′ diameters. Before you replace or consider new equipment, write: KOPPERS COMPANY, INC., 6805 Scott Street, Baltimore 3, Md.

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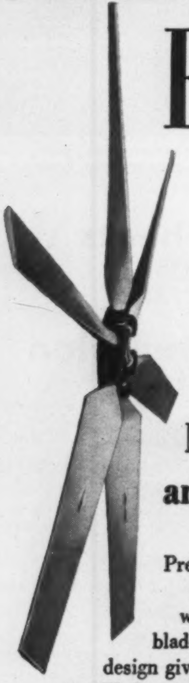

RECENT TRADE LITERATURE

Continued

let contains table as guide for determining relative effects of 330 chemical materials on company's seal rings. Sectional drawing of fittings, table of stainless steel tube, pipe sizes also included. *Vanton Pump & Equipment Corp., Dept. HPAC,* 201 *Sweetland Ave., Hillside N. J.*

▶ *STAINLESS STEEL TUBING, PIPE* — Technical data card "148-A" summarizes hot working, annealing, welding, forming data on 24 austenitic, hardenable, nonhardenable ferritic stainless tubing steels. *Babcock & Wilcox Co., Tubular Products Div., Dept. HPAC, Beaver Falls, Pa.*

▶ *STEAM GENERATOR* — Diagrammed, illustrated catalog "SB-59" describes features of company's integrated steam generating plant. It is pointed out that unit requires no field piping, wiring, brickwork nor special foundation. Complete specification table also included. *Erie City Iron Works, Dept. HPAC,* 1450 *East Ave., Erie, Pa.*

▶ *STEAM PISTON PUMPS* — Company's line of "Duplex" pumps is described in bulletin "202-22." These three-piston pumps are for boiler feed or other fluid pumping operations. Choice of construction materials offered, from bronze fitted to all iron, or all bronze fittings. Performance, dimension charts describe 12 sizes and cutaway view shows construction details. *American-Marsh Pumps, Inc., Dept. HPAC, 60 Capital Ave., N.E., Battle Creek, Mich.*

▶ *STEAM TRAPS* — Information on line of impulse steam traps given in new 8 page bulletin "T-1742 (57)." Typical installations for all series shown with dimensions, capacities, weights. Included are data on: "Series 60" and "Series 120" traps for normal condensate loads at pressures to 400, 600 psi, temperatures

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or
COOLING
Call for
G&O
...THE
GREATER-HEAT-TRANSFER,
EXTENDED-SURFACE TUBING
★ known for reliability since 1915 ★

Individual Fin Tubing
Square Fin, Continuous, Return Bend Coil
Square Fin, U-Bend Tubing
Unit Heater Coil
Continous Strip Fin, All-Aluminum Cooling Coil

- Tubes & Coils
- Individual finned tubing in standard sizes, square or round fins of any height or spacing
- Straight lengths, U-bends, continuous return-bend; special shapes
- Single pass, header-to-header
- Simple to install
- Free design assistance
- Write for catalog

"If it's to transfer heat, G & O can't be beat"

THE G&O
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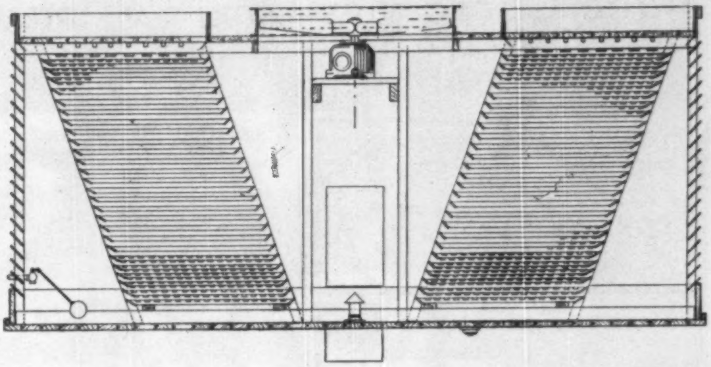
New Haven, Conn.
•
1420 Ridgeway St.
Jackson, Miss.

G&O
RADIATION

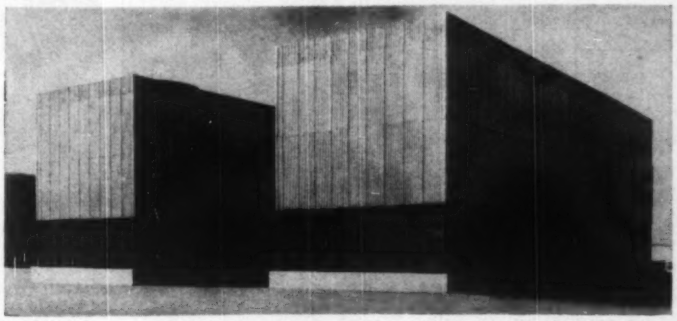


Phillips

"Dual Airstream"

The Phillips Dual-Airstream — Series "DA" Cross-Flow Towers have the answer when low tower height and minimum plan area size are desired.

The DA Series Towers are designed for single cell capacities of 150 to 600 tons of refrigeration and are also available in multi-cell arrangements. The DA Series Towers constructed of California Redwood or Hot Dipped Galvanized Structural Steel Framing and Corrugated Cement Asbestos Board Siding offer long life with a minimum of maintenance.



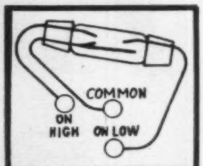
Shown above is a conventional Phillips Cooling Tower Co. counter-flow type installation. The Phillips counter-flow towers are individually designed to economically meet each project's particular requirements.

Counter-flow type towers may be designed to have any desired capacity, and are offered in the same materials as the DA Series Towers for long life and minimum maintenance.

Phillips
Cooling Tower Co., Inc.
220 DUPONT ST., BROOKLYN 22, N. Y.

Three Operations One Control

MULTI-PURPOSE PRESSURE CONTROL



Single pole, cut in high (close on rise)

Single pole, cut in low (open on rise)

or Single pole, Double throw

PROVIDES

- External Adjustments
- Repetitive Trip Point
- Repetitive Reset Value
- Visible Calibrated Dial
- Visible Contact

Note Minimum Differentials for each Range

Adjustable Operating Range Psig	Maximum Momentary Surge	Min. Diff. Psig
0-30" Vac.*	30	2"
10" Vac. 12#*	30	1#
0-14#	30	1
0-20#	30	1
0-35	50	1¾
0-60	125	3
0-60	150	6
0-100	125	3¾
0-100	200	6
0-100	300	6
0-150	200	7
0-150	240	8
0-150	300	8
0-200	240	8
0-200	300	8
0-300	400	12
0-300	600	14
0-600	800	50
0-1000	1500	75

Series DA 20, 30, 50, 60, listed by UL and CSA

THREE CASE STYLES AVAILABLE

GENERAL PURPOSE (NEMA 1) Illustrated —for indoor use.

WEATHER-PROOF (NEMA 1A, 2, 3, 4,)—for outdoor use.

EXPLOSION-PROOF (NEMA 7)—for hazardous locations.

WRITE FOR CATALOG NO. 858
THE MERCOID CORPORATION
CHICAGO 41, ILL.

RECENT TRADE LITERATURE

Continued

to 450 and 650 F; "Series 20-A" and "Series 120-A" for same maximum operating temperatures and pressures, with lower condensate discharge capacities; "Series 40" for extra heavy condensate loads at up to 750 F. *Yarnall-Waring Co., Dept. HPAC, Chestnut Hill, Philadelphia.*

▸ *SUMP PUMP STANDARDS* — New engineering standards for sump pumps given in publication of Sump Pump Manufacturer's Association. Standards are voluntary, not intended to be discriminatory or restrictive to individual manufacturer, says chairman of association's engineering committee. *Sump Pump Manufacturer's Association, Inc., Dept. HPAC, Mills Bldg., Washington 6, D. C.*

▸ *TIME CONTROLS* — "Time, Past Present and Future" is title of 32 page booklet "5820-C", which gives facts on measurement of time through ages and into future in full color cartoon style. *Paragon Electric Co., Dept. HPAC, 1609 12th St., Two Rivers 3, Wis.*

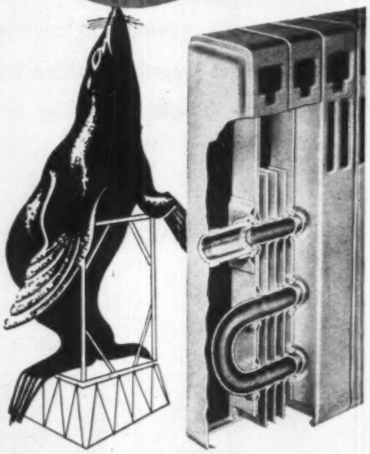
▸ *TIMER CONTROLS*—Hand-size, 32 page booklet, "Neat Tricks with Paragon Controls," outlines practical uses for time control, describes company's line of timer controls. *Paragon Electric Co., Dept. HPAC, Two Rivers, Wis.*

▸ *VELOCITY METER* — Data book describes procedure for testing, balancing air diffusers with company's "Alnor Velometer." Each section of book contains engineering data on brand of diffuser, with instructions on procedure that establishes air delivery of various types, sizes of units. *Illinois Testing Laboratories, Inc., Dept. HPAC, 420 N. LaSalle St., Chicago 10.*

ONLY SHAW radiators

deliver radiant and convected heat

Properly Balanced



Shaw Panel Radiators distribute a carefully engineered combination of radiant and convected heat that only Nature, at her best, can rival.

Shaw's health-guarding proportions of radiant and convected heat will not vary regardless of hot water or steam temperature. There is no stratification—heat is distributed evenly throughout the room.

Investigate Shaw Panel Radiators. They are rugged, self-contained steel and copper units, of one-piece-bonded construction, easy to handle and install. Heights are 8" to 26"; lengths 11" to 111". Choice of same end or opposite end tapping on all models facilitates piping economies and proper radiator location. Write today for full information.

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MANUFACTURING COMPANY
201 East Carson St. • Pittsburgh Pa

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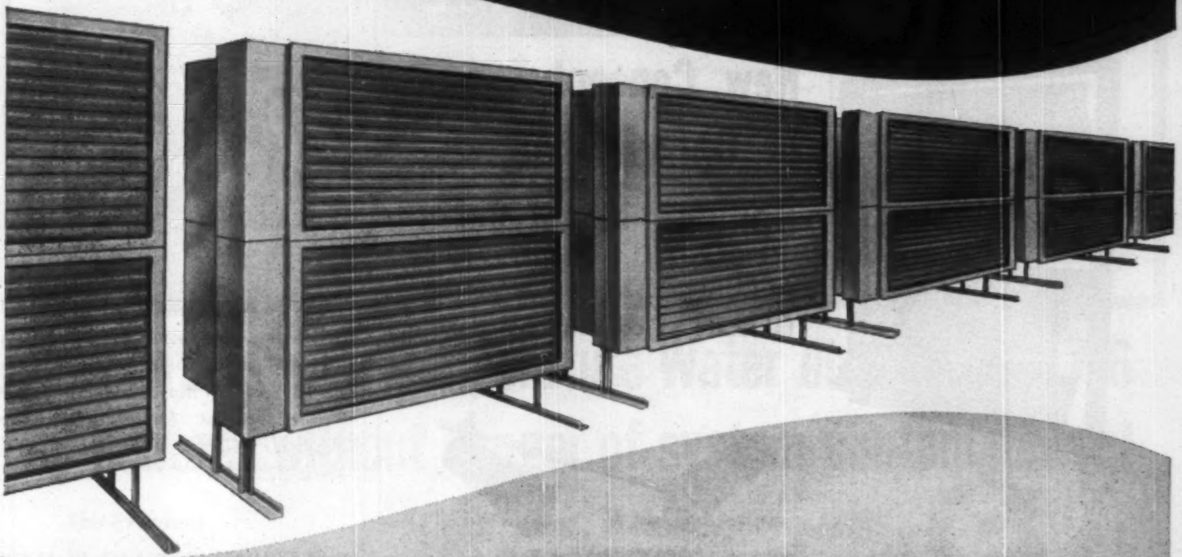
UNICON
for UNLIMITED TONNAGE



Kramer Unicon has brought a new era into the industry. With more than 20 years of unique practical experience and know-how in dry condensing, Kramer again offers new avenues of opportunity to the air conditioning and refrigeration industry.

Unicon now has no capacity limit. Standard Unicon systems up to 540 tons are now cataloged for the first time.

Unicons for heat pump applications are now also available with no horsepower limitations.

Kramer engineering and design has proven that the Unicon can move large volumes of air with extreme quietness.

Unicon has long proven by actual experience that it is free from fouling or corrosion and requires practically no maintenance.

The total operating weight per ton for Unicon is very low, resulting in minimum platform and reinforcement requirements.

Unicon space requirements are surprisingly small; a 300 ton system requires only 15′ x 14′ floor space and is 12′ high.

WRITE FOR BULLETIN U-391

KRAMER TRENTON CO. • Trenton 5, N.J.

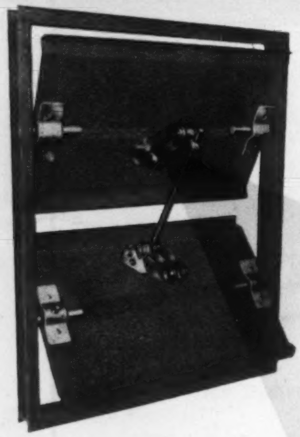
44 YEARS OF CONTINUOUS ACHIEVEMENT IN HEAT TRANSFER

DURO DYNE

NEW

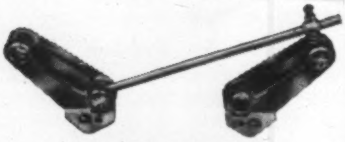
"OPAX"

OPPOSED ACTION LINKAGE



New Concept in Opposed Action Damper Construction

ACCURATE! and as easy to fabricate as conventional dampers.



"OPAX" Linkage Set is Complete as Shown

- "OPAX" Set attaches directly to blade — No Stands.
- Accurately operates damper blades as narrow as 5"
- Extremely simple to lay-out and install.
- Neva-Bind construction assures smooth operation . . . Compensates for damper inaccuracies.

Write now for complete information and local distributor — or . . . send $1.00 for sample "OPAX" Linkage Set.

THE GREATEST NAME IN SHEET METAL SPECIALTIES

BLADE KIT
FLEXIBLE CONNECTOR
DURO DYNE
ADHESIVE
TAPE
QUADRANT

DURO-DYNE CORP., Route 110, Farmingdale, New York

RECENT TRADE LITERATURE

Continued

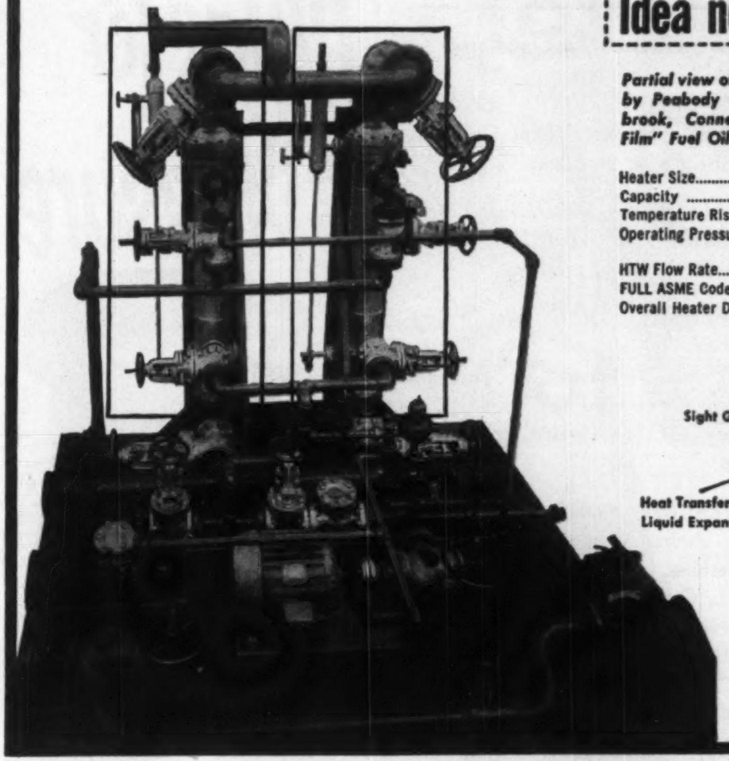
▶ *WATER DEMINERALIZER* — Revised, enlarged bulletin "WC-111A" describes demineralization process. Information and charts included on materials of construction, design of component parts. Also includes charts on multi-bed, mixed-bed, scavenger or polishing demineralizers, indicating application, advantage of each, with results to be expected. Other sections devoted to automatic control, regenerating systems, chemical handling, conductivity measurement. Details of important accessories discussed. *Graver Water Conditioning Co., Dept. HPAC,* 216 *W.* 14*th St., New York* 11.

▶ *WATER TREATMENT* — Research report titled "Influence of Bicarbonate Ion on Inhibition of Sodium Silicate in Zinc-Iron System" by Henry L. Shuldener, president of Water Service Laboratories, and Leo Lehrman, Professor of Chemistry, City College of New York, issued as a 12 page, illustrated pamphlet. *Water Service Laboratories, Inc., Dept. HPAC,* 615 *W.* 131*st St., New York* 27.

▶ *WELDING FITTINGS, FLANGES* —Bulletin FB-503 explains ways to prepare requisition or order for welding fittings, flanges. Ordering details for quantity, nominal pipe size, weight designation, description, material, bevels, marking, delivery outlined. *Babcock & Wilcox Co., Tubular Products Div., Welding Fittings Dept., Dept. HPAC, Milwaukee* 48.

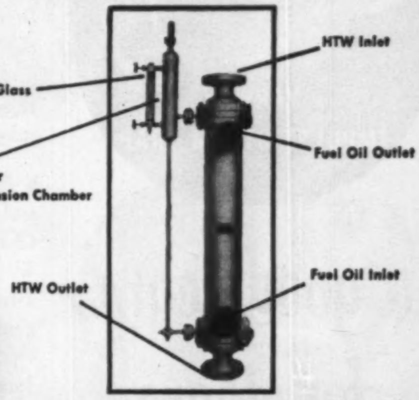
▶ *WET VACUUM PUMPS* — Bulletin "221-22" describes company's line of "Simplex" pumps for vacuum heating systems, manufacturing processes requiring vacuums to 26 inches. Bulletin also lists choices of construction materials, performance and dimension data. *American-Marsh Pumps, Inc., Dept. HPAC,* 60 *Capital Ave., N.E., Battle Creek, Mich.* ╪

Idea no. 2 from Paracoil



Partial view of pump and heater set fabricated by Peabody Engineering Corporation, Glenbrook, Connecticut, utilizing two "Thermo-Film" Fuel Oil Heaters of these specifications:

Heater Size	FF-48 HTW "Thermo-Film"
Capacity	7500 lbs. No. 6 oil per hour
Temperature Rise	80°F to 210°F
Operating Pressures	300 psi, water side 315 psi, oil side
HTW Flow Rate	100 GPM at 370°F
FULL ASME Code Construction	
Overall Heater Dimensions	15" x 6'-6"



How to use High Temperature Water directly in a #6 oil heater...without danger of system contamination!

The Problem

The pre-heating of #6 fuel oil with High Temperature Water to provide adequate oil temperature and eliminate possibility of leakage of fuel oil into the HTW stream.

Leakage of fuel oil into the HTW stream would result in contamination of the system and could cause serious and costly damage to the boiler and the entire system.

The isolation of the fuel oil heaters can be accomplished by several methods. For example, the HTW stream may be passed through an evaporator to supply steam for use in a steam-type fuel oil heater. Or, the HTW stream may be passed through an intermediate water-to-water exchanger to heat a secondary water stream circulated through a water-type fuel oil heater.

In both of these systems, the HTW stream is safely isolated from the fuel oil heater by an intermediate secondary circuit. But effective as these methods are, they both require a minimum of two heat exchangers, additional space and additional connecting piping, regulators, level controls, etc.

A New Solution

Now for the first time the Paracoil "Thermo-Film" Fuel Oil Heater furnishes the optimum solution to the problem. **In a single exchanger** the "Thermo-Film" Heater provides adequate oil temperature, isolation of the HTW circuit from the oil circuit, a reduction in space requirements, simplicity of operation and substantially lower initial installation cost. A number of double tube elements are enclosed within the heater shell providing three circuits: the primary HTW circuit, an intermediate heat transfer fluid circuit, and the oil circuit.

The heat flow path is from the HTW to the heat transfer fluid to the fuel oil. In the rare event of an oil tube failure, the free oil cannot contaminate the HTW stream as it becomes trapped in the intermediate space containing the heat transfer liquid, and gives warning to the operating personnel by rising in the indicating gauge glass at the expansion chamber.

Your inquiries for Paracoil "Thermo-Film" applications to HTW systems are invited.

CUT ALONG DOTTED LINE AND SAVE

DAVIS ENGINEERING CORPORATION

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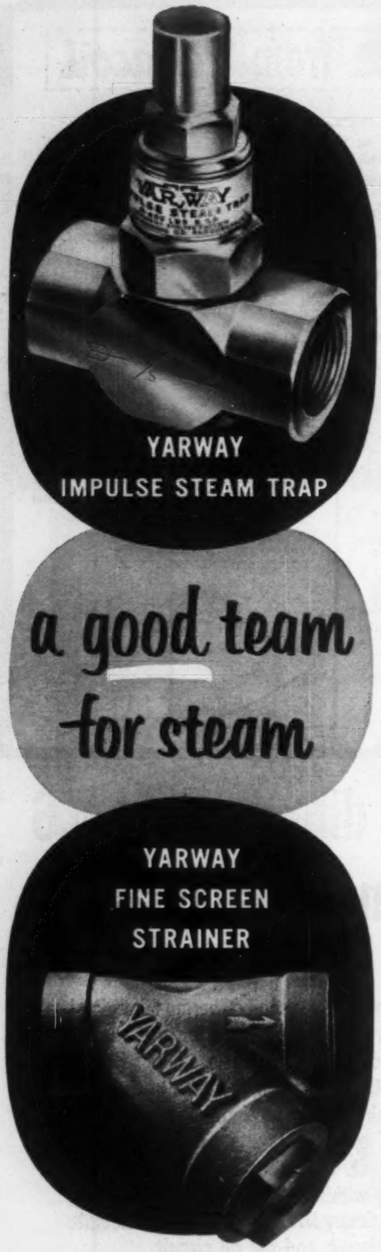

This Yarway team has scored high—over a million installed on all types of steam equipment. Stocked and sold by 270 Industrial Distributors. For free Steam Trap Book, write YARNALL-WARING Co., 107 Mermaid Ave., Philadelphia 18, Pa.

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(New personnel, promotions)

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▶ *DETROIT CONTROLS DIV. OF AMERICAN-STANDARD CORP.*—William A. Haist, president.

▶ *PEERLESS MFG. DIV. OF DOVER CORP.*—F. W. Carter, chairman; Thomas D. Bromley, president, succeeding Mr. Carter; Robert B. Stone, vice president—sales.

▶ *MERCOID CORP.*—Hugh Courteol, chairman of the board; J. F. Chambliss, president and treasurer; W. L. Colterjohn, vice president and director; W. K. Stauffer, vice president—eastern area; R. F. Fisher, vice president—western area; W. E. Jones, vice president—sales; P. J. Provost, vice president—industrial division; Paul Courteol, secretary.

▶ *SIMPSON ELECTRIC CO.*—J. R. Whiteside, president.

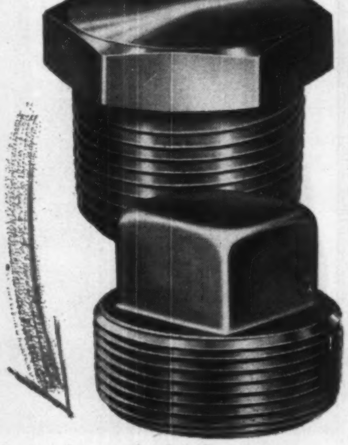
▶ *MIDWEST PIPING CO., INC.*—O. P. Carter, president.

▶ *TAGLIABUE MFG. CO.*—Albert C. Schilling, president.

▶ *HARRY ALTER CO.*—Harry Alter, chairman of the board; Irving Alter, president; Besse P. Mostow, treasurer; N. K. Hurwitz, secretary; James Alter, executive vice president, Chicago div.; Warren Kahn, executive vice president, New York div.; Martin Kent, vice president and general manager, New York; Murray Adinoff, vice president and sales manager, New York; Joseph Novotny, vice president and advertising manager; Filmore Weinstein, vice president and merchandise manager.

▶ *CONTROLS CO. OF AMERICA*—George T. Weymouth, elected to board of directors; Robert W. Sloane, product manager for oil controls sales; D. C. Albright, product manager for refrigeration controls sales.

plugs for Pressure



forged steel, high pressure plugs with DRY SEAL tapered threads

CAPITOL square head and hex head solid plugs have dry seal tapered threads to assure safe, permanent high pressure installations. Conveniently packaged for easier handling.

Square Head Solid Plugs sizes 1" thru 2", all forged steel. Hex Head Plugs sizes ½" thru 2" machined from solid bar.

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BUSHINGS — PLUGS — REDUCERS —
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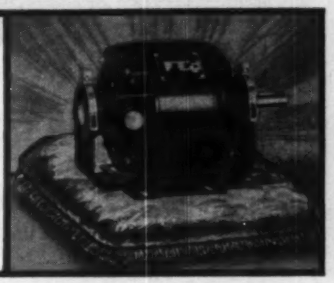
. . . and every one a perfect fit



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Since 1890

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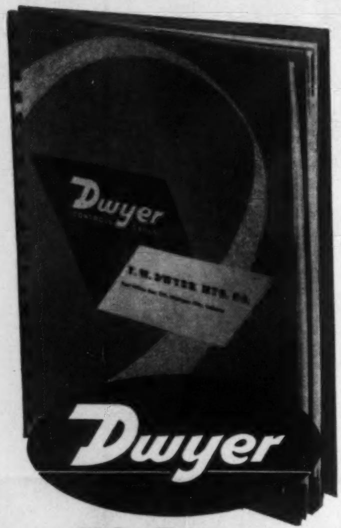
to All Users of
GAGES and
CONTROLS



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▶ *DEMING CO.*—Harry Carloss, executive vice president; Rolland Webber, vice president in charge of sales; George Emeny, vice president; Walter Everett, assistant treasurer.

▶ *AMERICAN MACHINE AND METALS, INC.*—I. Newton Becker, executive vice president.

▶ *A. W. CASH VALVE MFG. CORP.*—Raymond S. Doherty, vice president.

▶ *WORTHINGTON CORP.*—David S. Gibson, vice president — purchasing, succeeding John S. Summersby, who is retiring after 42 years of service; Thomas F. Griffin, general manager of purchases, succeeding Mr. Gibson; Paul Des Jardins, manager of new product and marketing planning department; Andrew F. Ward, manager of distribution; Earl R. Michel, manager of direct sales; Peter A. McLeod, manager of product sales; John C. Conrad, product sales manager for centrifugal refrigeration products; Charles V. Bengle, manager of applied systems.

▶ *BRYANT MFG. CO. DIV. OF CARRIER CORP.*—William M. Day and Gordan N. Gray, vice presidents; Roy C. East, advertising manager.

▶ *AIR REDUCTION SALES CO.*—J. J. Lincoln, Jr., president of *PURE CARBONIC CO.* division of company; J. H. Keeney, vice president, southern region.

▶ *BUENSOD-STACEY, INC.*—Henry Johnson Foster, elected to board of directors.

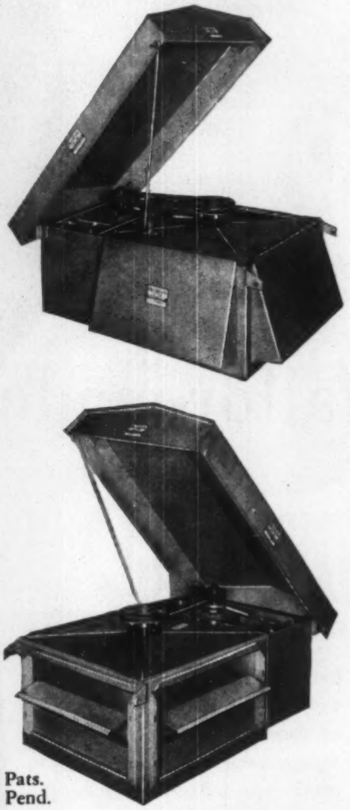
▶ *PARAGON ELECTRIC CO.*—J. R. Kenny, vice president — finance, treasurer and assistant treasurer, elected to board of directors; G. J. Platt, executive vice president and assistant treasurer; R. W. Eldred, vice president—sales; J. J. Everard, vice president—engineering.

▶ *AMERICAN WATER SOFTENER CO.*—Robert L. Seitz, vice president and sales manager.

AirMpeler

LO-BOY
CENTRIFUGAL ROOF EXHAUSTERS

Enhance the Beauty of Building Skylines



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Lowest Silhouette Design

Forward or Backward Curve Wheel Within . . . . or Out of Scroll Housing

Motor mounting on side of structure support . . . out of line of air stream reduces height of Lo-Boy models nearly 50% of older designs.

LOW WIND RESISTANCE
SIZES 10"-72" 600-47,000
CERTIFIED C.F.M. RATINGS

- QUALITY ● BEAUTY
- PROVEN PERFORMANCE

See Sweet's File 20c/Amm or Write for bulletin HA-100 58

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MEMBER OF THE AIR MOVING & CONDITIONING ASSN.

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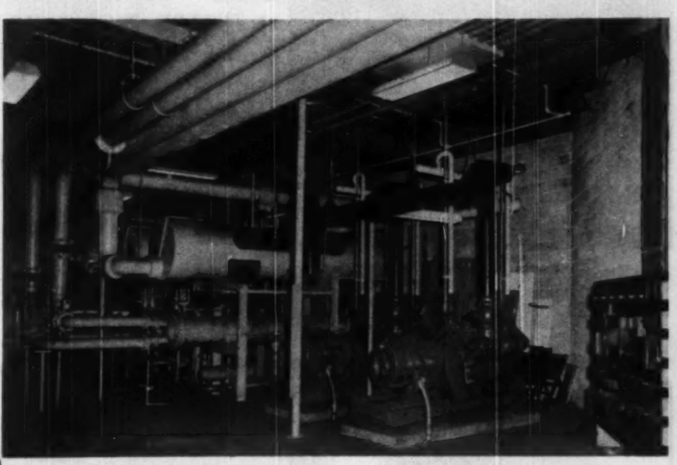
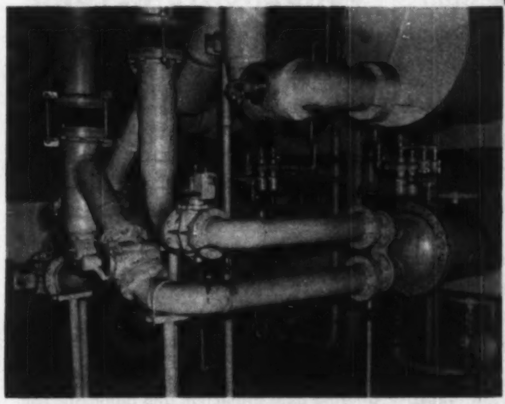
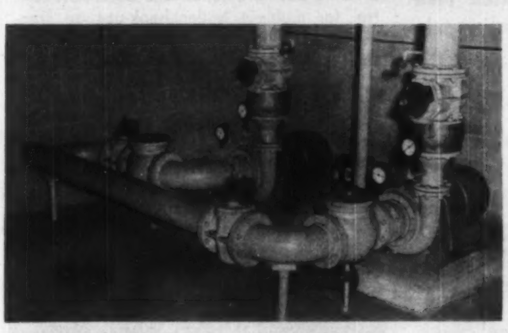
-Everywhere!

More air conditioning engineers and contractors throughout the country are turning to DeZurik Valves every day!

This system was installed in the York road branch of Stewart's Department Store of Baltimore by George A. Peters Co., designed by Henry Adams Inc., both of Baltimore.







DeZurik Valves have DEFINITE advantages!

The eccentric design principle and resilient-faced plug of a DeZurik Valve give you advantages *no other valve can give you!*

They operate easily, every time — without lubrication —close dead-tight with a quarter-turn of the lever. DeZurik Valves have no metal-to-metal seat to score . . . no seat rings to replace, no long top works extending from the pipe . . . are ideal for balancing.

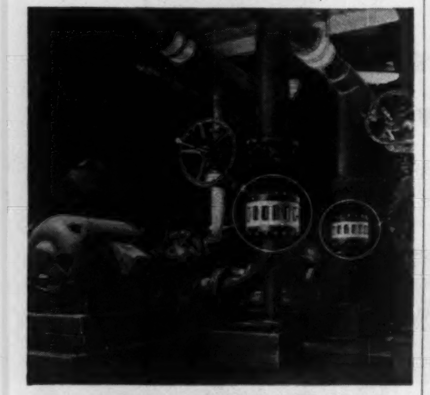
Because the plug contacts the seat *only* when the valve is closed, DeZurik Valves operate easily *all* the time; there's no friction, no freezing, no need for lubrication! Because of their resilient-faced plug, you get dead-tight shut-off every time. And they're the most maintenance-free valves you've ever seen! The rotary-stem packing never needs adjustment; minor plug wear is self-compensating.

On the system shown here, DeZurik Valves are installed on pump lines, chilled water and condenser lines. Wherever you install them, you'll find DeZurik Valves are the most versatile, most dependable valves you can use. And they cost *less* than most ordinary valves!

In sizes 1/2" thru 20", in a wide range of metals and models. For more information, see the DeZurik representative in your area, or write

DeZURIK
CORPORATION
SARTELL, MINNESOTA.

STOP
SURGE-PRESSURE
DAMAGE
in Air Conditioning Systems



Installation in 525 William Penn Place Building in Pittsburgh.

Globe type for 3" to 24" lines.
Center-guided type for 1" to 10" lines.

WILLIAMS-HAGER
FLANGED
Silent
CHECK VALVES

Surge pressures . . . and resulting water hammer . . . are effectively controlled by these valves. They close instantly whenever flow reversal starts, or when flow is zero—providing dependable protection for piping, pumps and other components in air conditioning systems.

Write for Bulletins:
No. 654 on the Valves
No. 851 on Cause, Effect and Control of Water Hammer

THE WILLIAMS GAUGE CO., INC.
155 Stanwix Street
2 Gateway Center Pittsburgh 22, Pa.
Our 72nd Year • 1886-1958

WHO'S WHAT *Continued*

▶ *IRON FIREMAN MFG. CO.*—Richard C. Wright, vice president; Jack Jordan, assistant to the president.

▶ *AMERICAN COILS CO.*—John A. Kirk, vice president in charge of production.

▶ *BINKS MFG. CO.*—William W. Roche, elected to board of directors.

▶ *INTERNATIONAL HEATER CO.*—Albert I. Whitely, vice president in charge of sales and elected to board of directors.

▶ *W. D. ALLEN MFG. CO.*—William F. Symonds, vice president in charge of the manufactured products division.

▶ *STONE & WEBSTER ENGINEERING CORP.*—Edwin H. Krieg, elected to board of directors.

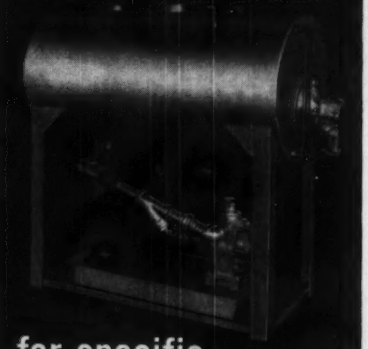
▶ *REFLECTAL CORP., SUBSIDIARY OF BORG-WARNER CORP.*—Dean M. Hennessy, secretary; John R. Devitte, director of purchasing.

▶ *BORG-WARNER CORP.*—Harry P. Troendly, group vice president.

▶ *CUTLER-HAMMER, INC.*—J. M. Cook, vice president — marketing; E. B. Fitzgerald, apparatus sales manager; L. P. Niessen, advertising and public relations manager; F. A. Wright, general sales manager; R. C. Monahan, marketing research manager; H. B. Phillips, quantity sales consultant.

▶ *JOSEPH T. RYERSON & SON, INC.*—Herbert G. Dent, engineering consultant to vice president in charge of operations; Stanley J. Miller, director of plant engineering; Robert D. Allison, general superintendent of Pittsburgh steel service plant; Charles E. Weston, assigned to operating controls division in company's general offices in Chicago; Robert T. Stafford, general manager of Seattle steel service plant.

Now
4 Systems



for specific performance in specialized fields

Preferred
CONDENSATE RETURN SYSTEMS

STANDARD SIMPLEX—For single boiler hook-ups where there is minimum need of attention, safety, water treatment and control. 19 sizes in 3 pressure classifications.

SCHOOL MASTER—A complete system with tank, controls, pumps and dual protection. This unique series incorporates feed water treatment control equipment for completely automatic operation, requiring minimum janitorial attention. 19 sizes in single pressure classification, specifically designed for automatically-fired school heating systems.

CUSTOM DUPLEX—A heavy-duty system offering dual protection and automatic control for multiple boiler hook-ups on commercial and light industrial installations. 19 sizes in 3 pressure classifications.

POWERPACK—For large industrial installations requiring continuous performance under the most taxing conditions. Offered for dual protection systems in both single and multiple hook-ups. Custom designed, with corrosion-resistant tanks, duplex turbine-type pumps, mechanical seals, automatically controlled de-aerating heaters and special alloy monitoring equipment. 76 model combinations.

PREFERRED UTILITIES MANUFACTURING CORP.
1860 Broadway • New York 23, N. Y.

You can count on

HIGHER PROFITS

WITH

Curtis

AIR CONDITIONERS

HERE'S WHY...

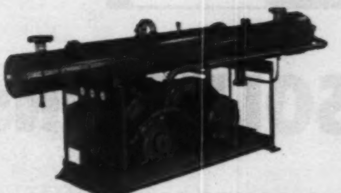
MAXIMUM DEPENDABILITY
Each CURTIS unit is backed by 104 years of engineering and manufacturing experience . . . one of many reasons why CURTIS air conditioning equipment operates at maximum efficiency with a minimum of maintenance.

CUSTOMER SATISFACTION
The long operational life and minimum service requirements of CURTIS air conditioning, combined with peak performance, assures satisfied customers.

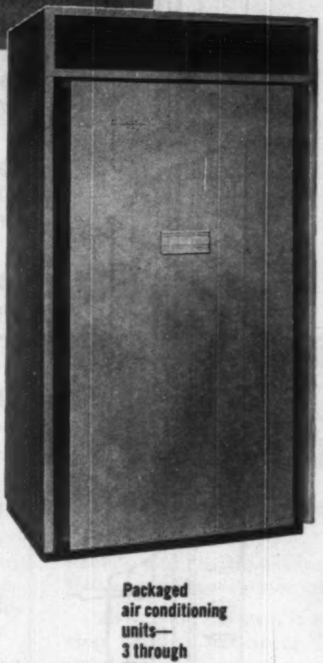
PRE-SOLD PROSPECTS
National advertising beamed at virtually every prospect category helps *pre-sell* Curtis equipment for you. CURTIS provides sales and promotional aids to make your selling job *easier*.

PRICED FOR PROFITS
All Curtis air conditioning equipment is *competitively* priced, with a very generous profit margin *for you!*

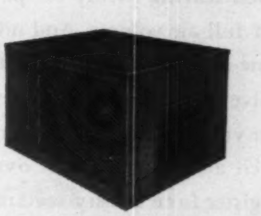
Evaporative Condensers
and Cooling Towers
up to 100 tons
Air handling units to match.



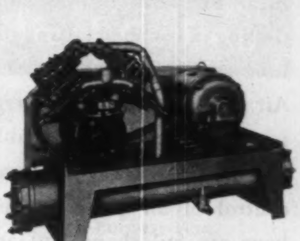
Packaged Liquid Chillers—
7½ to 100 tons—F-12 or F-22.
With room console units to provide
controlled cooling and heating
without duct work.



Packaged
air conditioning
units—
3 through
50 tons.



Packaged Air Cooled Air
Conditioning Units—2
through 7½ tons. Residential
and commercial applications.

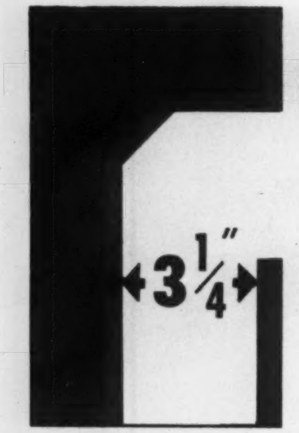


Condensing units up to
100 tons—F-12 or F-22.

REMEMBER—
you can count on Curtis

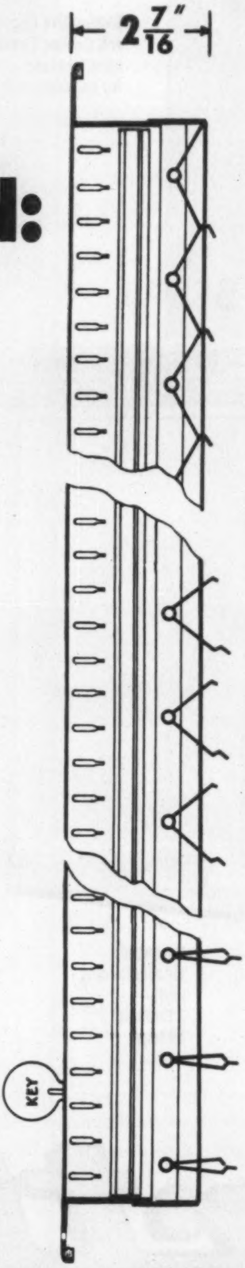
OUR 104th YEAR
MANUFACTURING COMPANY • REFRIGERATION DIVISION
1950 Kienlen Ave., St. Louis 20, Mo.

C-35



PROBLEM:

To find a commercial-type register with four way air-direction control plus volume control, that will work in standard 3¼" duct.



SOLUTION:

AIR CONTROL'S *Multi-Trol* Registers have exclusive **Shallo-Valve** – fit fine in 3¼" duct, leaving plenty of space for full air volume. And note how this patented butterfly valve action provides positive air volume control – assures even air distribution over register face at any setting. Seals *tight* when closed – can't whistle or rattle.

Ideal for both heating and cooling in commercial and deluxe residential installations, Air Control's *Multi-Trol* registers feature fully adjustable face bars for 2-way or 4-way control of air pattern. Bars have air foil shape and are locked to side margins – can't come loose. Complete range of style and sizes. Attractive beige prime coat.

FREE '58 CATALOG SHOWING COMPLETE AIR CONTROL LINE — SEE YOUR JOBBER OR WRITE US.

AIR CONTROL PRODUCTS, Inc.
358 Center St., Coopersville, Michigan

WHO'S WHAT

Continued

▶ *ARMSTRONG CORK CO.*—Dr. Alfred H. Williams, director; William B. Newkirk, general credit manager.

▶ *CHASE BRASS & COPPER CO.*—Albert T. Both, assistant vice president—operations; Howard C. Walters, Cleveland works manager, succeeding Mr. Both; John J. Vreeland, special consultant—heat exchanger sales; John F. VanLandeghem, staff manager—sheet and strip, succeeding Mr. Vreeland.

▶ *DRESSER MFG. DIV. OF DRESSER INDUSTRIES, INC.*—E. R. Torgler, director of manufacturing; J. R. Harrahill, acting works manager; Charles Kuhn, sales manager, regular products; Stephen B. Hodges, director of marketing planning and control.

▶ *DODGE MFG. CORP.*—Alex T. Bodle, consulting engineer; Jackson Chung; chief engineer; Donald P. Lower, manager of engineering.

▶ *QUAKER RUBBER DIV. OF H. K. PORTER CO., INC.*—S. William Riley, chief project engineer.

▶ *MUELLER CLIMATROL DIV. OF WORTHINGTON CORP.*—William Crooker, chief engineer for the western zone.

▶ *COURTER & CO.*—Joseph A. Courter, re-elected president of the Building Trades Employers' Association of New York City.

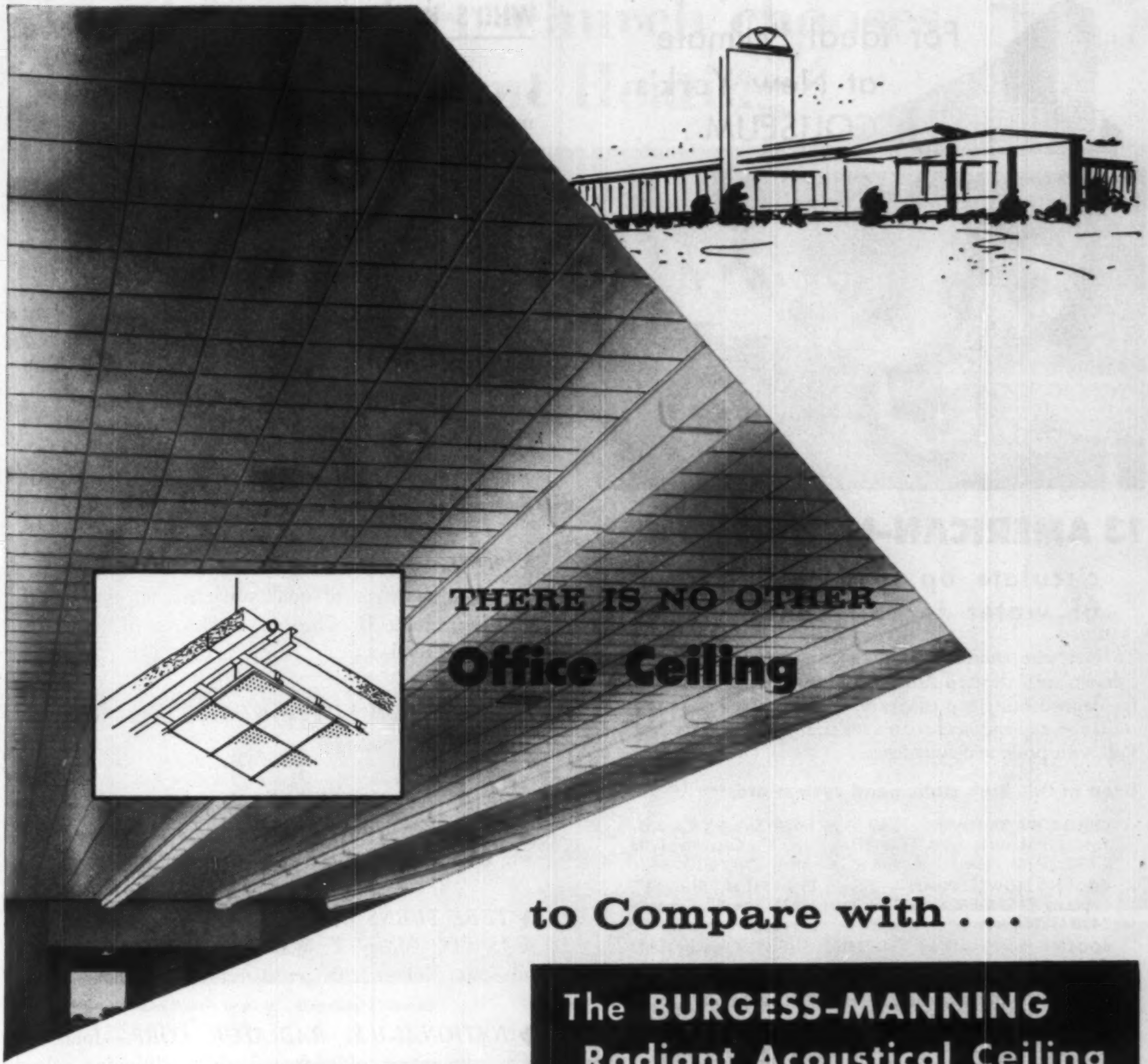
▶ *UTILITY APPLIANCE CORP.* and *MISSION APPLIANCE CORP.*—James M. Starke, general manufacturing manager.

▶ *CRANE CO.*—William O. Brown, general manager of sales.

▶ *THOR POWER TOOL CO.*—William J. Miller, supervisor of construction equipment division sales for western United States; Elmer R. Stitt, supervisor of construction equipment division sales for eastern United States; William F. Fowler, manager of branch operations. Frank Kamon, chief air tool engineer; Peter Rebechini, chief electrical tool engineer; James A. Perham, chief product engineer.

▶ *CANTON STOKER CORP.*—Joseph C. Fosselman, general sales manager.

▶ *CHASE BRASS & COPPER CO.*—Albert T. Both, assistant vice president—operations; Howard C. Walters, Cleveland works manager, succeeding Mr. Both.



THERE IS NO OTHER

Office Ceiling

to Compare with . . .

The BURGESS-MANNING Radiant Acoustical Ceiling

The only completely integrated Radiant Acoustical Ceiling

It is the most modern concept in comfort conditioning. It is years past the experimental stage. Its performance has been proved by use in many types of buildings.

The Burgess-Manning Radiant Acoustical Ceiling is the ideal ceiling for any building where human comfort is a first consideration.

Combining thermal comfort conditioning and acoustical control in the same unit, this ceiling performs both functions with equal efficiency. It heats or cools by radiant energy, independent of air movement and does not produce drafts. Room temperatures are always practically uniform from floor to ceiling. With Burgess-Manning Radiant Heating and Cooling human comfort can be maintained with lower than average room temperatures. Where many people are working in the same room, its extreme uniformity of heating and cooling eliminates the hot and cold spots that cause dissatisfaction and complaints.

As economical as it is efficient, the Burgess-Manning Radiant Acoustical Ceiling introduces a new standard of comfort conditioning for commercial buildings.

Remember

Your Building is Better

Your Building Budget No Bigger

Write for Burgess-Manning Catalog No. 138-2H

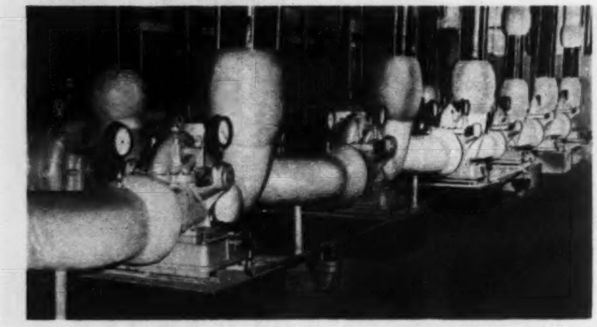
3 Heating Cooling Acoustical

BURGESS-MANNING COMPANY

Architectural Products Division

5970 Northwest Highway, Chicago 31, Ill.

For ideal "climate"
at New York's
COLISEUM . . .



13 AMERICAN-MARSH PUMPS

circulate up to 31,650 g.p.m. of water for air conditioning

To meet the enormous cooling requirements of this busy "showplace," thirteen American-Marsh Pumps were selected for dependability and efficiency. The result is a pumping installation any engineer-contractor team could specify and install with pride and confidence.

Used in this high static head system are:

CHILLED WATER PUMPS — *Two* Type HIM, Size 6", Capacity 1650 GPM each. *One* Type HIM, Size 5", Capacity 1200 GPM. *Three* Type HLM, Size 8", Capacity 2500 GPM each.

COOLING TOWER PUMPS — *Three* Type HLM, Size 12", Capacity 3750 GPM each. *Two* Type HLM, Size 8", Capacity 2400 GPM each.

BOOSTER PUMPS — *Two* Type HIM, Size 6", Capacity 1800 GPM each.

All are horizontal split case type centrifugal pumps, specifically fitted for the job. Each individual pump was fully tested and proved to meet or exceed all specifications before shipment.

This standard-practice thoroughness and attention to quality means that *you* can specify American-Marsh Pumps with full confidence! Write today for data — or call your nearby A-M Representative.

New York Coliseum construction project:

OWNER—Triborough Bridge & Tunnel Authority
ARCHITECT—Leon and Lionel Levy
MECHANICAL ENGINEER—Guy B. Panero
STRUCTURAL ENGINEER—Dr. Jacob Feld
GENERAL CONTRACTOR—Walsh-Fuller-Slattery
HEATING, VENTILATING AND AIR CONDITIONING CONTRACTOR—Almirall & Co., Inc.

WRITE TODAY for Bulletin 350

AMERICAN-MARSH PUMPS
BATTLE CREEK MICHIGAN

Pumps and Pumps only Since 1873

CENTRIFUGAL, TURBINE, STEAM AND POWER PUMPS FOR TESTING, PROCESSING, BOILER FEED, FIRE PROTECTION, ETC

WHO'S WHAT

Continued

▶ *SOLAR AIRCRAFT CO.*—William F. Briney, manager of industrial products sales.

▶ *SLANT-FIN RADIATOR CORP.*—Norman Stoll, head of public relations department.

▶ *NATIONAL ELECTRONICS CONFERENCE*—Arthur H. Streich, full time general manager.

▶ *OLIN MATHIESON CHEMICAL CORP.*—John M. Welch, director of field sales for company's aluminum products; Harry E. Gude, vice president in charge of manufacturing for the aluminum division; John P. Jansson, manager of architectural sales for the corporation's aluminum division.

▶ *PITTSBURGH PLATE GLASS CO.*—James D. Doughty, manager of quality control for glass fiber division; John H. Clark and Thomas R. Aberant, marketing analysts.

▶ *PITTSBURGH NIPPLE WORKS, INC.*—Raymond P. Heid, sales manager.

▶ *MANNING, MAXWELL & MOORE, INC.*—Edmund R. Lehmann, manager of application engineering for the corporation's industrial controls div.

▶ *TUBE TURNS DIV. OF NATIONAL CYLINDER GAS CO.*—Morry T. Wakefield, industrial relations director; Robert J. Dilger, director of purchases.

▶ *NATIONAL-U.S. RADIATOR CORP.*—John E. Craig, manager of packaged air conditioning sales; Fred S. Hudson, general sales manager of the heating and air conditioning division.

▶ *LUNKENHEIMER CO.*—Richard G. Brown, industrial relations director.

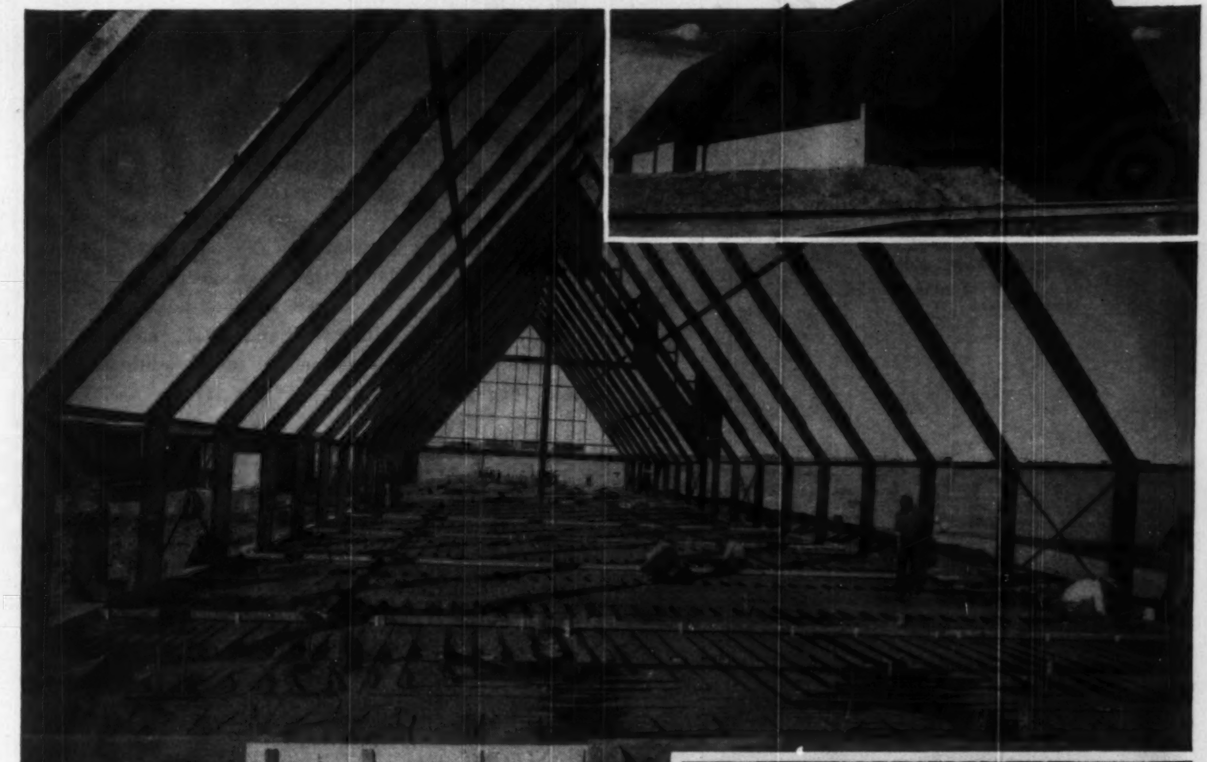
▶ *RECOLD CORP.*—S. Robert Adachi, chief engineer of refrigeration products; Walter L. Hilton, western sales manager.

▶ *DRAYER-HANSON DIV. OF NATIONAL-U.S. RADIATOR CORP.*—Walter Dwyer, sales engineer.

▶ *DUNHAM-BUSH, INC.*—Fred H. Gentsch, product manager for air compressors.

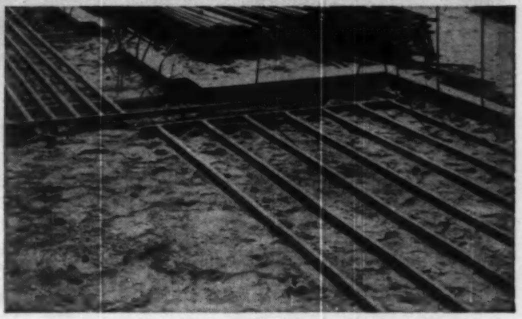
▶ *PATTERSON-KELLEY CO.*—C. E. Drake, chief engineer of company's heat exchanger division, elected president of the Fuel Oil and Water Heater Manufacturer's Association.

Another modern church chooses Steel Pipe Radiant Heating



Steel Pipe Radiant Panels in main auditorium, 1" standard black pipe on 12" centers.

Perimeter of building, 1¼" standard black pipe on 6" centers with 1½" headers.



Write for the free 48 page color booklet "Radiant Panel Heating with Steel Pipe"

While the beautiful churches of yesteryear are loved and admired, the need for more, but less pretentious, suburban churches has brought a fresh architectural concept to these.

In modern church construction, comfort, practicality and all-week usefulness are keystone factors. An adequate kitchen may rank with auditorium acoustics in importance. Certainly steel pipe radiant panel heating and sidewalk snow melting are part of today's suburban church planning.

In this Pueblo, Colorado, Christ the King Catholic Church, as in many others, a steel pipe radiant panel heating system will provide perfect, draft-free comfort for 9120 square feet of floor area.

Yes, steel pipe is first choice for radiant heating . . . as it is for snow melting, plumbing, fire protection systems, electrical conduit, gas, steam and air transmission lines, and structural pipe applications. Steel pipe gives the ultimate in service for every dollar spent!

Committee on
STEEL PIPE RESEARCH
AMERICAN IRON AND STEEL INSTITUTE
150 East Forty-Second Street, New York 17, N. Y.

Steel Pipe is First Choice

Only Steel Pipe gives all these advantages!

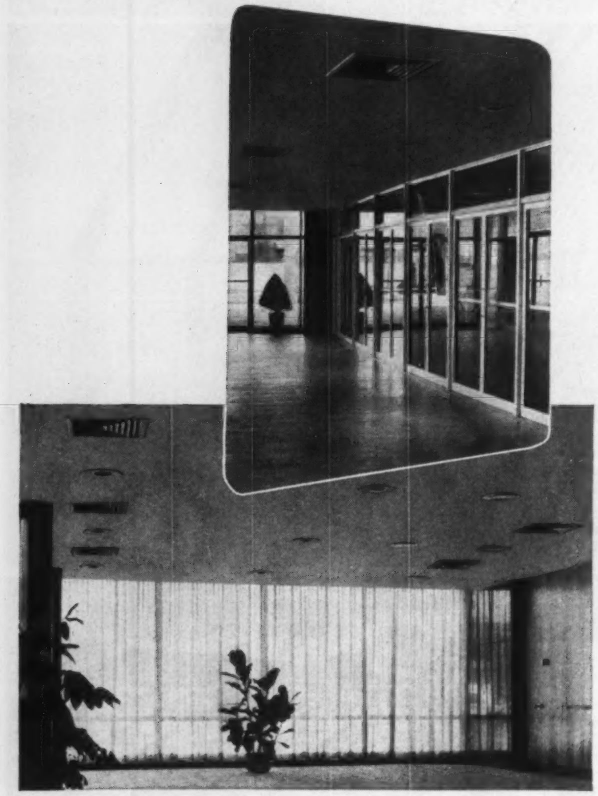
- Low cost with durability
- Strength unexcelled for safety
- Formable—bends readily
- Weldable—easily, strongly
- Threads smoothly, cleanly
- Sound joints, welded or coupled
- Grades, finishes for all purposes
- Available everywhere from stock

AGITAIR®

Custom Made

SQUARE and RECTANGULAR

AIR DIFFUSERS



Custom made in unlimited air patterns, AGITAIR square and rectangular air diffusers suit all job conditions ... blend perfectly with any interior design.

These AGITAIR diffusers need not be centrally located. They assure draftless, noiseless, equalized air distribution from any location in the ceiling or side wall.

Write for Catalog R107 for complete data.

THERMOTANK AGITAIR

high velocity units • punkah louvers
air diffusers • filters • exhausters

Sold exclusively by representatives for:

AIR DEVICES INC.

185 MADISON AVENUE, NEW YORK 16, N. Y.

WHO'S WHAT

Continued

▶ *MANNING AND LEWIS ENGINEERING CO.*—Walter Veit, vice president, and John DeLorenzo, elected vice president and treasurer, respectively, of the Fuel Oil and Water Heater Manufacturers' Association.

▶ *AMERICAN GAS ASSOCIATION*—Henry E. Littlehales, assistant director of public information; Lorne S. Waddell, manager of press relations.

▶ *FAIRBANKS, MORSE & CO.*—Charles F. Doepke, manager of public relations and advertising.

▶ *FRICK CO.*—John T. Sanders III, assistant sales manager in refrigeration and air conditioning division.

▶ *FEDDERS-QUIGAN CORP.*—Joseph Giorano, assistant to the vice president of manufacturing; Walter Weiss, chief engineer of room air conditioners.

▶ *GENERAL CONTROLS CO.*—Harmon B. McLendon, account executive for industrial controls sales.

▶ *ECLIPSE FUEL ENGINEERING CO.*—Erwin E. Hirschberg, sales manager of the company's combustion division.

▶ *BOHN ALUMINUM & BRASS CORP.*—R. H. Money, executive staff engineer.

▶ *BROOKS ROTAMETER CO.*—Richard P. Homiller, applications engineer.

▶ *AMERICAN-STANDARD PLUMBING AND HEATING DIV.*—Douglas P. Baldwin, manager of company's pottery division.

▶ *PLICOFLEX, INC.*—L. L. Whiteneck, vice president and director of materials research, elected president of National Association of Corrosion Engineers.

▶ *WALWORTH CO.*—R. F. Fred Klein, manager of lubricated plug valve sales.

▶ *YEOMANS BROTHERS CO.*—Spaulding A. Norris, general sales manager.

▶ *RICHMOND ENGINEERING CO.*—J. S. Lough, elected secretary of Fuel Oil and Water Heater Manufacturer's Association.

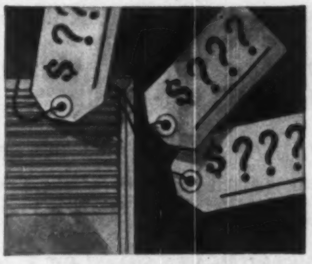
▶ *BETTER HEATING-COOLING COUNCIL*—Warren L. Owens, field director.

Every engineer should know

How CHRYSLER'S AIRTEMP controls

The 3 "Secret Costs" of Air Conditioning

You can't measure the real cost of air conditioning by the price tag on the equipment



Real cost depends on long-term savings versus long-term expenses

Specify Airtemp today, and ten years from now your client will still be grateful for your good judgment. It's the finest air conditioning he can buy. Yet it's also the least expensive. Year after year, Airtemp will cut your client's expenses by reducing the 3 "secret costs" of air conditioning to a minimum.

THE SECRET COST OF WRONG EQUIPMENT
The wrong equipment can be troublesome as well as costly to operate. Airtemp makes all kinds of air conditioners—over 297 models—and can advise you on which is best for your client's needs. You're sure to get exactly the right equipment from Airtemp!

THE SECRET COST OF OPERATION
Operating costs over a few years may actually exceed the first cost of air conditioning. But rock-bottom operating costs can save substantial sums. That's why you should know that AIRTEMP—thanks to Chrysler engineering—promises the lowest operating costs in the industry!

THE SECRET COST OF MAINTENANCE
Maintenance costs and repair costs can be a shock. A breakdown brings repair bills PLUS the cost of lost time, lost business. But Airtemp air conditioning is carefully engineered by Chrysler for trouble-proof operation. And Airtemp is installed only by qualified contractors, who must certify to Airtemp that equipment warranted for 5 years has been installed properly. That's why Airtemp maintenance costs average out to be the lowest in the industry!

May we give you the complete facts? For prompt action mail the coupon below. Or phone your nearest Airtemp contractor or dealer who is listed in the Yellow Pages.

CHRYSLER

Airtemp

AIRTEMP DIVISION, CHRYSLER CORP.
Dept. HP-5-58, Dayton 1, Ohio
We would like the full facts on how Airtemp controls the 3 "secret costs" of air conditioning.

Name________________

Address________________

City________ Zone____ State______

Firm Name________________

WHO'S WHAT

Continued

▶ *SUBURBAN PROPANE GAS CO.*—A. R. Olson, elected president of the Compressed Gas Association.

▶ *LINDE CO. DIV. OF UNION CARBIDE CORP.*—Claude E. Monlux, elected first vice president of the Compressed Gas Association.

▶ *PURE CARBONIC CORP. DIV. OF AIR REDUCTION CO.*—George C. Cusack, elected second vice president of the Compressed Gas Association.

▶ *J. F. PRITCHARD & CO. OF CALIFORNIA*—Karl E. Johnson, elected president of the Cooling Tower Institute.

▶ *FOSTER WHEELER CORP.*—Denis E. O'Neil, elected vice president of the Cooling Tower Institute.

▶ *MARLEY CO.*—Forrest B. Reed, elected secretary of the Cooling Tower Institute.

▶ *HUDSON ENGINEERING CORP.*—Ennis C. Smith, elected treasurer of the Cooling Tower Institute.

▶ *INSTRUMENT SOCIETY OF AMERICA*—Thomas K. Hodges, director of information.

▶ *DOLE VALVE CO.*—John L. Dole, president, appointed trustee of Illinois Institute of Technology.

▶ *TRANE CO.*—Robert Yeomans, secretary.

▶ *EDWARD VALVES, INC.*—William F. Crawford, appointed trustee of Illinois Institute of Technology.

▶ *TUTHILL PUMP CO.*—J. J. Janecek, treasurer.

▶ *TORK TIME CONTROLS, INC.*—Michael D. Bizzoco, production manager; Arnold Taufner, Jr., product control manager.

▶ *TENNEY ENGINEERING, INC.*—Dr. Bruno Sachs and Milton D. Blauner, elected to the board of directors.

▶ *ROBERTSHAW-FULTON CONTROLS CO.*—H. F. Jacobsmeyer, sales manager of *GRAYSON CONTROLS DIV.*

▶ *TACO HEATERS, INC.*—William W. Wexler, manager of marketing.

▶ *WOLVERINE TUBE DIV. OF CALUMET & HECLA, INC.*—W. D. Schelbe, director of purchases.

stop the high cost of corrosion

in closed recirculating water systems with CORROSION INHIBITOR CS

Corrosion Inhibitor CS has a special auxiliary inhibitor that gives corrosion protection to brass and copper as well as to other metals normally found in closed systems. This unique property of Corrosion Inhibitor CS assures complete corrosion control with the result that maintenance costs are lowered, pipe replacements and equipment failures are reduced.

Corrosion Inhibitor CS has no tendency to sludge or scale at high concentrations. It will not stain and does not affect normal skin. CS treatment is compatible with common antifreeze. It provides positive protection for systems in standby.

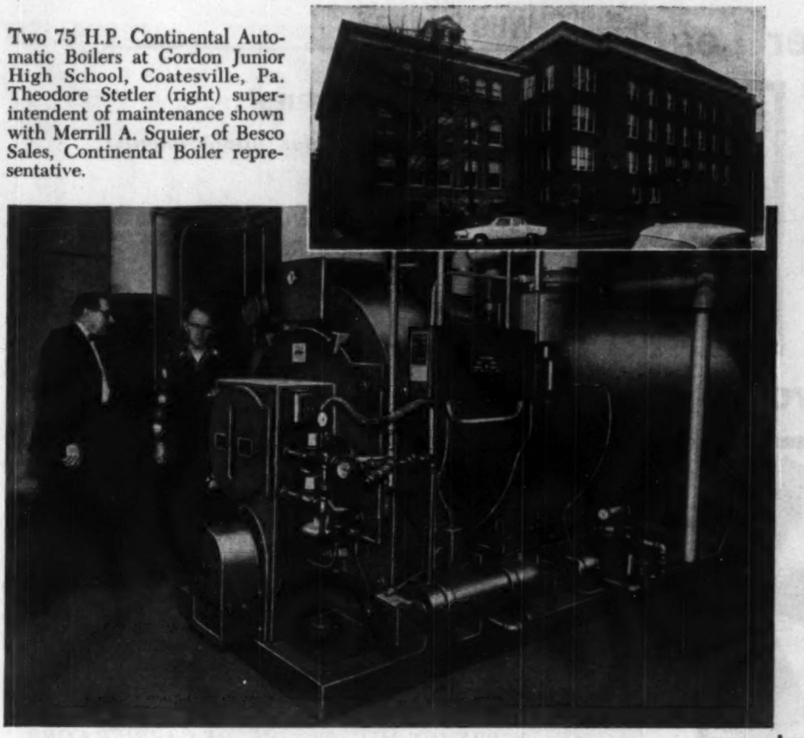
If you have a corrosion problem in any type of closed recirculating water system, write for our free bulletin. Learn how Corrosion Inhibitor CS can help stop the high cost of corrosion.

Corrosion Inhibitor CS stops pitting like this as well as other forms of corrosion.

HAGAN CHEMICALS & CONTROLS, INC.

HAGAN BUILDING, PITTSBURGH 30, PENNSYLVANIA
DIVISIONS: CALGON COMPANY, HALL LABORATORIES
IN CANADA: HAGAN CORPORATION (CANADA) LIMITED, TORONTO

Two 75 H.P. Continental Automatic Boilers at Gordon Junior High School, Coatesville, Pa. Theodore Stetler (right) superintendent of maintenance shown with Merrill A. Squier, of Besco Sales, Continental Boiler representative.



HEATING COSTS CUT 21% with new Continental Boilers

In 1955, the Coatesville, Pa. school district purchased two new 75 H.P. Continental Automatic Boilers firing #5 oil to heat three adjoining school buildings from a central plant. The new boilers saved $2,614.51 in the first two years of operation. This is a 21% reduction in heating costs.

Merrill A. Squier, of Besco Sales, Continental Boiler representative in the Philadelphia area, says:

"You can count on Continental for highly efficient, low cost steam or hot water. Because of the simplified design, maintenance and downtime are cut to the bone. There are no refractory baffles to burn out, leak and cause short circuit of gases. Free rapid water circulation keeps heating surfaces clean. Steam and water spaces are easily checked through openings. Clean-out is easy."

Continental Boilers, firing oil or gas, are available in models from 20 to 600 H.P. with on/off, low-high-low, or modulating controls. For steam heating or process work at pressures from 15 to 250 lbs., or hot water heating at low or high temperatures. Literature on request.

BOILER ENGINEERING & SUPPLY COMPANY, INC.
Phoenixville, Penna.

The Continental
AUTOMATIC BOILER

A HALF CENTURY OF BOILER MANUFACTURING EXPERIENCE

Let your Continental Automatic Boiler Specialist Help You

CALIFORNIA
El Cerrito—American Engineering & Mfg. Corp.
Palm Springs—Pacific Engineering Equip. Co.

COLORADO
Englewood—Champion Specialty Co.

DISTRICT OF COLUMBIA
Washington—Charles C. Plummer

FLORIDA
Jacksonville—H. L. McMurry & Co.
Miami—H. L. McMurry & Co.
Orlando—H. L. McMurry & Co.
Tampa—H. L. McMurry & Co.

GEORGIA
Atlanta—Mechanical Associates
Augusta—Tarte Boiler Repair Co.

ILLINOIS
Chicago—Automatic Steam Sales Co.

INDIANA
Indianapolis—Plibrico Sales & Service Co.
New Albany—Falls Cities Boiler & Machine

LOUISIANA
New Orleans—Cressy Sales Company

MARYLAND
Baltimore—Heating Services, Inc.

MASSACHUSETTS
Dorchester—Lewis National Corp.

MICHIGAN
Dearborn—Kramer & Associates, Inc.

MINNESOTA
Minneapolis—Oil Burner Service Co., Inc.
St. Paul—Lincoln Equipment Company

MISSISSIPPI
Jackson—Climate Engineers, Inc.

MISSOURI
St. Louis—Continental Boiler & Sheet Iron Works

NEBRASKA
Omaha—Midwest Utility Service Co., Inc.

NEW YORK
Buffalo—W. J. Clark Equipment Co.
Gloversville—Olin T. Caldwell & Co.
Hudson Falls—Boiler Equipment Co.
New York—Thermal International, Inc.
Rochester—Ernest J. Rookey
Syracuse—U & S Supply Corp.

NORTH CAROLINA
Greensboro—M. G. Newell Co., Inc.

OHIO
Cincinnati—Kenneth B. Little Co.
Cleveland—P. M. Equipment Co.
Toledo—Air Conditioning Distributors, Inc.

OKLAHOMA
Oklahoma City—Mecha-Line Co.

PENNSYLVANIA
Phoenixville—Besco Sales, Merrill A. Squier
Pittsburgh—John C. Gregg Company

RHODE ISLAND
Providence—Weatherall Engineers, Inc.

TENNESSEE
Knoxville—Boiler Supply Co.
Memphis—Middle States Associates, Inc.
Nashville—Boiler Supply Company

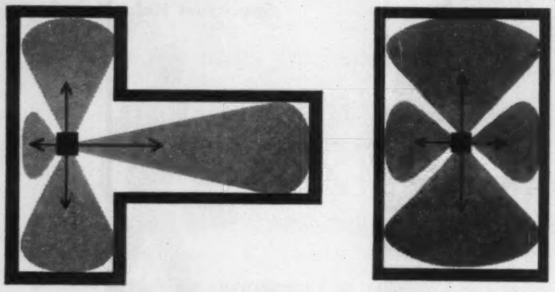
TEXAS
Dallas—Rodgers Engineering Co., Inc.
Fort Worth—J. P. Philibert

UTAH
Salt Lake City—Power Engineering Company

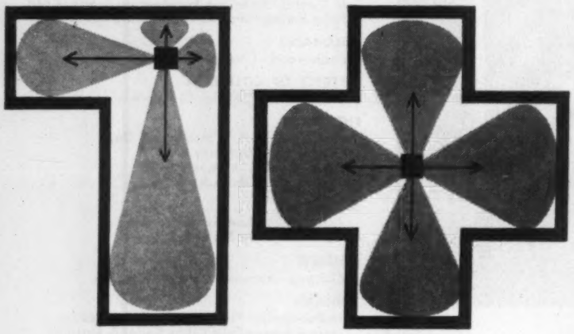
VIRGINIA
Suffolk—C. Fred Bailey

WISCONSIN
Milwaukee—Industrial Steam, Inc.

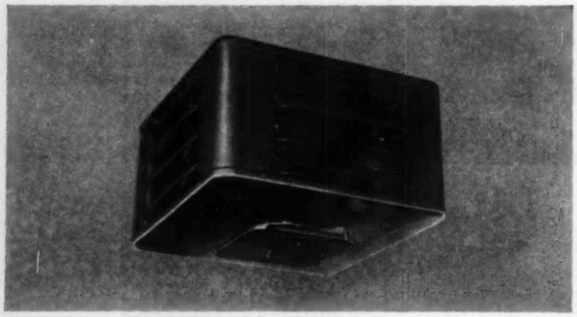
How one "Clover Leaf"



does the work



of two or more conventional heaters



Just one of Carrier's exclusive "Clover Leaf" Unit Heaters with variable 4-way air distribution effectively heats up to 8000 square feet of floor area. Carrier's greater, more flexible coverage means fewer units are needed, resulting in impressive savings in first cost, installation and upkeep. For steam or hot water, in 8 sizes: 55,000 to 600,000 Btu/hr.

For a complete catalog on the "Clover Leaf," call your Carrier manufacturer's agent. Look in the Classified Telephone Book under "Heaters—Unit." Or write Carrier Corporation, Dept. UH, Syracuse, New York.

Complete Line of Unit Heaters. Over 50 years' leadership in temperature control! Carrier knows heating!

Carrier

industrial heating • air conditioning • refrigeration

WHO'S WHAT

Continued

IN THE TERRITORIES . . .

(Recent sales appointments)

▸ *PARAGON ELECTRIC CO.*—Warren A. Petersen, western regional marketing manager.

▸ *LARKIN COILS, INC.*—Carl J. Bomanz, sales representative for southern Wisconsin, Indiana, northern Illinois and western Michigan; O. R. Kreutziger, sales representative for Minnesota, Iowa, northern Wisconsin, North Dakota and South Dakota; Robert C. Smith, sales representative for Texas, Oklahoma and Arkansas.

▸ *McQUAY, INC.*—D. E. Nanry & Associates, sales representatives for Detroit area; C. C. Perry Co., sales representative for Chicago area; Associated Sales Engineers, Clearwater, Fla. representative; Harold O. Knape & Co., representative for Houston area.

▸ *BRYANT MFG. CO., DIV. OF CARRIER CORP.*—Ralph C. Terhune, central regional manager.

▸ *AIR REDUCTION CO., INC.*—N. F. Moody, district sales manager for Philadelphia; H. F. Colt, Jr., district sales manager for Boston.

▸ *AUTOMATIC SWITCH CO.*—Berkness Control and Equipment Corp., Richmond, Va., authorized distributors; Kelburn Equipment Co., Berwyn, Ill., authorized distributors.

▸ *BABCOCK & WILCOX CO.*—Boiler Div. moved to 1367, The Illuminating Building, 55 Public Square, Cleveland 13.

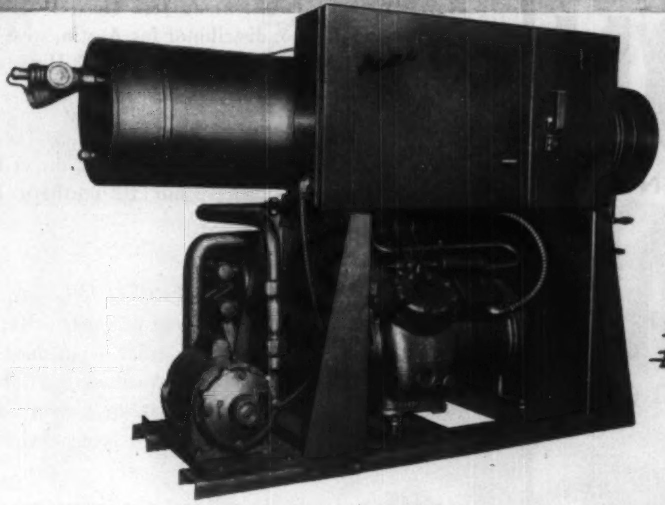
▸ *BUENSOD-STACEY, INC.*—Mussun Equipment Co., representative for Cleveland.

▸ *CHICAGO BLOWER CORP.*—Donald W. Davis, sales manager for western two thirds of the country.

▸ *CLEAVER-BROOKS CO.*—Frank R. Goulding, sales manager for Atlanta district; R. W. Watson, sales manager for the Milwaukee district; R. E. Costin, sales manager for Dallas area; W. B. Stoehr, sales manager for the San Francisco area.

▸ *COCHRANE CORP.*—Robert G. Zimmerman, in charge of engineering sales at new Buffalo branch office, P. O. Box 2687 Amherst Branch, Buffalo 26.

TODAY'S MOST ADVANCED SMALL TONNAGE LIQUID CHILLER



... the Acme FLOW-COLD®

It's Flow-Cold *again* for '57 — the most advanced, most specified line of packaged chillers in the 3 thru 20-ton range. Whether you're an engineer requiring the best in design and construction, or a contractor looking for ease of installation and trouble-free operation, there are good reasons for heading your chiller specifications with "Acme Flow-Cold."

The Flow-Cold's components—Dry-Ex® chiller, condenser, heat exchanger and super quiet, accessible-type, hermetic compressor — are tops for advanced engineering . . . proven performers! Flow-Cold chillers are *complete* packages . . . all piping and wiring factory-installed and tested *in operation.* All necessary controls are furnished . . . now fully enclosed to stop unauthorized tampering. And Flow-Cold chillers are not only factory tested, they're *certified* . . . a "first" among chiller manufacturers.

Now add the Flow-Cold's newly streamlined wiring and piping, neat, pre-formed pipe insulation and inherent compactness of Acme's Flow-Cold design . . . and you have a chiller that's just as *good looking* in an installation as it is efficient and economical to operate.

NOW TAMPER-PROOF

Ever experience the damage to a system from control "adjustments" by inexperienced personnel after a job is installed? The Flow-Cold's new enclosed box can be locked to "foil the fiddle fingers" and keep servicing in the hands of men who know how.

AND TEST-CERTIFIED

Proof of seven factory test procedures conducted under full load, Acme's Certificate of Performance guarantees every Flow-Cold's ready-to-go dependability.

Acme Industries, Inc.

ACME AIR CONDITIONING REFRIGERATION

Acme INDUSTRIES INC. Jackson, Michigan

Dry-Ex Liquid Chillers · Liquid Receivers · Heat Exchangers · Condensers · Packaged Chillers · Packaged Heat Pumps · Evaporative Condenser & Cooling Towers · Room Conditioners

Manufacturers of Quality Air Conditioning and Refrigeration Equipment since 1919

ALL STANDARD D-H "PERMA-FAN"

DRAYER

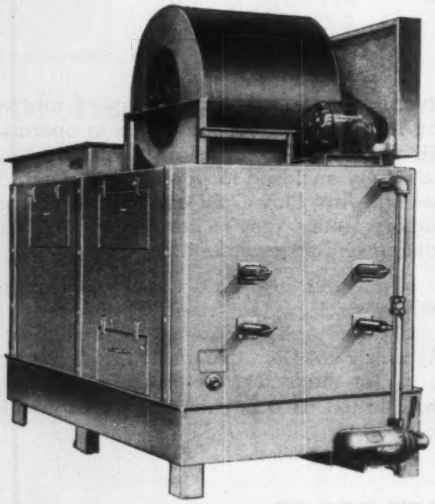
EVAPORATIVE CONDENSERS

HANSON

ARE HOT-DIP GALVANIZED

"PERMA-FAN"

AFTER FABRICATION!



A D-H EXCLUSIVE! FOR FREON 12; FREON 22; AMMONIA. THE D-H PIONEERED BLOW-THRU PRINCIPLE... NOT DRAW-THRU! PRIMARY COIL SURFACE COPPER TUBING. VOLUME DAMPER ADJUSTMENTS. PRICE? WAY DOWN, ON BEDROCK! 12 MORE FEATURES SHOWN IN OUR "PERMA-FAN" BULLETIN. MAY WE SEND YOU A COPY? WRITE:

d-h SINCE 1910

drayer-hanson
DIVISION OF NATIONAL-U.S RADIATOR CORP
3301 MEDFORD STREET
LOS ANGELES 63, CALIFORNIA
CABLE: CLINCONI LOS ANGELES

WHO'S WHAT

Continued

▶ *PENN CONTROLS, INC.*—Francis M. Halloran, manager of district sales office in Boston.

▶ *QUAKER RUBBER DIV., H. K. PORTER CO., INC.*—F. W. Heitmann Co., Houston, distributor in Harris County, Texas, area; Jess McNeel Machinery Corp., San Antonio, distributor for Austin, west Texas, and Rio Grande Valley areas; Everett G. Harvey, sales engineer.

▶ *RUUD MFG. CO.*—John T. Benedict, direct factory representative in Chicago and 10 northern Illinois counties.

▶ *JOSEPH T. RYERSON & SON, INC.*—A. Philip Brendel, manager of reinforcing products sales; David W. Wolff, manager of general order department; Gene W. Sullenger, field sales representative; Robert E. Minser, general sales representative; Calvin Gaubatz, head of aluminum sales, St. Louis steel service plant.

▶ *SPEEDWAY DIV. OF THOR POWER TOOL CO.*—Edward T. Michalek, sales manager.

▶ *TRANE CO.*—Frank Dalton, manager of company's San Antonio office; Robert M. Cox, New York office sales engineer; Gerald T. Kerbow, manager of Houston sales office; Air Conditioning Associates of New England, Sommerville, Mass., authorized source for company's package air conditioning equipment; Perfection Heating Corp., J. F. Rickard Plumbing & Heating Co., Wells & Sons Co. and Rahco Refrigeration Co., all of Cincinnati, and Tri-City Heating & Air Conditioning Co., Inc., Newport, Ky., named as authorized distributors for company's package air conditioning equipment.

▶ *H. O. TRERICE CO.*—Richard Mill, manager of company's new Dallas branch office; Roach Equipment Co., Inc., exclusive distributor for company's temperature instruments for Oklahoma.

▶ *TUBE FORGINGS OF AMERICA*—A. C. Grant, eastern division sales manager; William E. Hutchins, western division sales manager.

▶ *WARREN PUMPS, INC.*—Reginald F. Murphy, sales engineer in Boston sales office.

▶ *CRANE CO.*—Midcontinent Tube Service, Inc., Evanston, Ill., distributor.

*FIRST LINE *Extended Surface* HEAT EXCHANGERS

ASK THE AEROFIN MAN

Specify Aerofin and you specify high efficiency, long service life and low maintenance and service costs.

Take advantage of Aerofin's unequalled experience, production facilities, and materials-testing and design research—of Aerofin's complete engineering service at the plant and in the field.

Ask the Aerofin man.

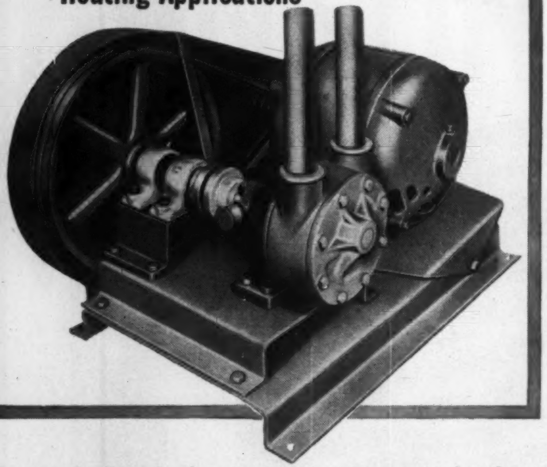
* Aerofin makes extended heat surface exclusively — not as a by-product, not as a side-line. Sold only by manufacturers of fan-system apparatus. List on request.

AEROFIN CORPORATION

101 Greenway Ave., Syracuse 3, N. Y.

new TUTHILL SU PUMP UNIT

- For Handling Heavy Fuel Oils
- In Packaged Boiler and Commercial Heating Applications

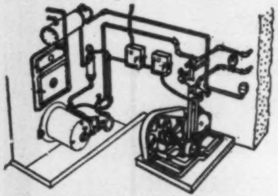


Economically priced, TUTHILL'S SU PUMP UNIT has been specifically developed for handling heavy fuel oils in commercial heating applications and with packaged boilers.

This "v" Belt Driven Unit is compact—complete units measure only 24¼" x 14⅝". Quiet operation is insured by the 2 or 4 "v" Belt Drive and the integral gear positive displacement pump design.

Construction features which provide dependable trouble-free operation, lower maintenance costs, include two ball bearing pillow blocks, one point take-up for simple adjustment of belt tension, removable belt guard and new fabricated steel base with versatile motor mounting.

SU PUMP UNITS can be furnished with a wide variety of pumps and motors for pressures up to 300 psi, capacities to 2030 gallons per hour. Sub-assemblies of pump, stub shaft, pillow block and sub-base are also furnished separately as a unit for incorporation into systems by boiler and furnace manufacturers. Write today for complete information.



Typical Application of SU Unit

TUTHILL PUMP COMPANY
947 East 95th Street, Chicago 19, Illinois
Gentlemen:
Please forward Catalog describing Tuthill SU Pump Units.
NAME________________COMPANY________
TITLE________________________
STREET________________________
CITY________________STATE________

TUTHILL PUMP COMPANY
947 East 95th Street, Chicago 19, Ill.
Canadian Affiliate: Ingersoll Machine & Tool Company, Ltd., Ingersoll, Ontario, Canada
PUMPS FOR YOUR PURPOSE

WHO'S WHAT

Continued

▶ *L. J. WING MFG. CO.*—Eaton Equipment Co., sales representative in the Detroit area; Brosey & Frew, Inc., Indianapolis representative; Service Refractories, Peoria representative; P. R. Deane Co., representative in Geneseo, Ill.

▶ *FAIRBANKS CO.*—Arthur F. Parris, salesman for northern Ohio sales territory; Joel R. Shattles, salesman for Virginia sales territory; William R. Bieritz, valves and dart unions salesman for Philadelphia sales office. Ellis F. Hendricks, trucks, casters and wheels salesman for Philadelphia sales office.

▶ *J. J. FINNIGAN CO.*—R. B. Dowdy and James A. Dowdy, Alabama representatives.

▶ *WORTHINGTON CORP.*—Fred J. Watt, New York national account supervisor for company's air conditioning and refrigeration division; R. O. Gundlach, air conditioning and refrigeration sales manager for midwest region.

▶ *CONOFLOW CORP.*—Control Equipment Co., Salt Lake City, sales agent for Utah and southern Idaho.

▶ *CYCLOTHERM DIV. OF NATIONAL-U.S. RADIATOR CORP.*— E. Paul Harder Associates, St. Louis, Mo., sales distributor.

▶ *DRESSER MFG. DIV. OF DRESSER INDUSTRIES, INC.*—Donald L. Garrison, Chicago district manager; James L. Mattern, southeastern district manager in Atlanta; Richard T. Alt, north central district manager in Minneapolis.

▶ *OLIN MATHIESON CHEMICAL CORP.*—A. M. Castle & Co., Chicago, national distributor for company's aluminum.

▶ *WESTINGHOUSE ELECTRIC CORP.*—William B. Cott, northeastern regional manager for corporation's air conditioning division.

▶ *AMERICAN AIR FILTER CO., INC.*—William Peters, manager of New York City branch office.

▶ *BARNEBEY-CHENEY CO.*—R. M. Hepner, Hepner Air Filter Service, sales representative in Cleveland area.

You're Getting Into The

PROFITSPHERE

When You Visit The

22ND NATIONAL OIL HEAT and AIR CONDITIONING EXPOSITION

NEW YORK COLISEUM — JUNE 9-12, 1958

EXCITING EXHIBITS – Your Profitsphere for 1958 will be found in row on row of exciting exhibits by leading manufacturers with new products . . . new systems . . . new methods . . . new ideas in merchandising, selling and training . . . installation and servicing. All arranged for easy visiting on the huge street level of the fully air conditioned New York City Coliseum. *Industry members admitted free.*

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You will also enter the Profitsphere by attending the convention's stimulating, idea-packed Dealer Management Conferences, Technical Symposium and Commercial-Industrial Conference. Outstanding operators in air conditioning, oil heating and fuel oil will describe successful management methods and profitable techniques in sales, installation, service and oil delivery. Virtually every facet of every segment of the industry will be covered.

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NOW is the time to consider

SNOW MELTING

Systems around Buildings and Grounds

Better send at once for our SNOW MELTING MANUAL. Here are design data based on a study of—and others' actual experience with over 100 snow melting systems of all kinds for

- LOADING PLATFORMS and DOCKS
- SIDEWALKS • ROADS • DRIVEWAYS
- MARQUEES • PARKING AREAS
- RUNWAYS • RAILWAY SWITCHES

and other applications which HAVE proved that this modern method of snow removal.

Costs No More Than Other Methods

—and because snow melting by pipe coils has other distinct advantages, such as dirt-free sidewalks and entrances, and the complete elimination of ice surfaces, the demand for this method of snow removal is swiftly growing.

Complete information on the correct design, installation and operation of snow melting systems is offered in the new SNOW MELTING MANUAL, a reprint of articles originally published in HEATING, PIPING & AIR CONDITIONING. Fifty cents per copy.

$0.50 will bring you this SNOW MELTING MANUAL . . . a valuable addition to your file on business opportunities.

Heating, Piping & Air Conditioning

6 North Michigan Avenue Chicago 2, Illinois

WHO'S WHAT

Continued

▶ *WOLVERINE TUBE, DIV. OF CALUMET & HECLA, INC.*—Melvin A. Jackson, sales representative in Indiana and Ohio area; Charles A. Johnson, sales representative in Chicago metropolitan area; Jack D. Zinser, sales representative in western Pennsylvania area.

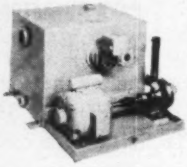
▶ *GUSTIN-BACON MFG. CO.*—William J. Crolly, sales representative for northern New Jersey area.

▶ *JOBE & CO.*—Baltimore office moved to 2857 Greenmount Ave.

▶ *AMANA REFRIGERATION, INC.*—Frank O. Brocksmith, special sales representative.

▶ *W-K-M, DIV. OF ACF INDUSTRIES*—Robert Muddiman Co., distributors for eastern Canada.

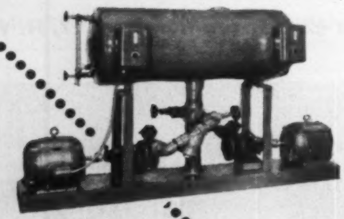
▶ *ALLIS-CHALMERS MFG. CO.*—R. J. Dineen, manager of General Products Division sales; A. P. Bowman, manager of Milwaukee district office; James I. Onarheim of manager of utility sales, Milwaukee district. Carl R. Hall, manager of Rockford, Ill. district sales office.



EAGAN EAGLE
—For steam heating loads up to 8000 sq. ft. at 20 p.s.i. Does not require pit even though return lines are no more than one foot above the floor.

EAGAN HOT POT —Vertical submerged type pump with cast iron receiver. Motor and pump above receiver safe from flooding. Single and duplex construction. Models for loads up to 15,000 sq. ft. at 20 p.s.i.

TYPE ECIV —Vertical pump and receiver for installations where return lines are below floor levels. Single or duplex units. Models up to 10,000 sq. ft. capacity at 60 p.s.i.



TYPE EC
—Straight line arrangement requiring less floor space than necessary for competitive makes. Both pumps accessible for maintenance purposes. Single and duplex models designed for 2000 to 100,000 sq. ft. discharging against pressures of from 10 to 200 p.s.i.

EAGAN...

the complete line of Condensate Return Pumps

Eagan offers a full line of Condensate Return Pumps, and also manufactures Fuel Oil Pump and Heater Sets, Proportioning Pumps, Turbine Pumps and Centrifugal Pumps.

WALTER H. EAGAN CO., INC.

Pump Specialists Since 1920

2336 Fairmount Ave., Dept. HPAC, Phila. 30, Pa.

Gentlemen:
Send me complete information on the EAGAN Line of Condensate Pumps.

COMPANY ....

NAME ....

ADDRESS ....

CITY .... ZONE .. STATE ....

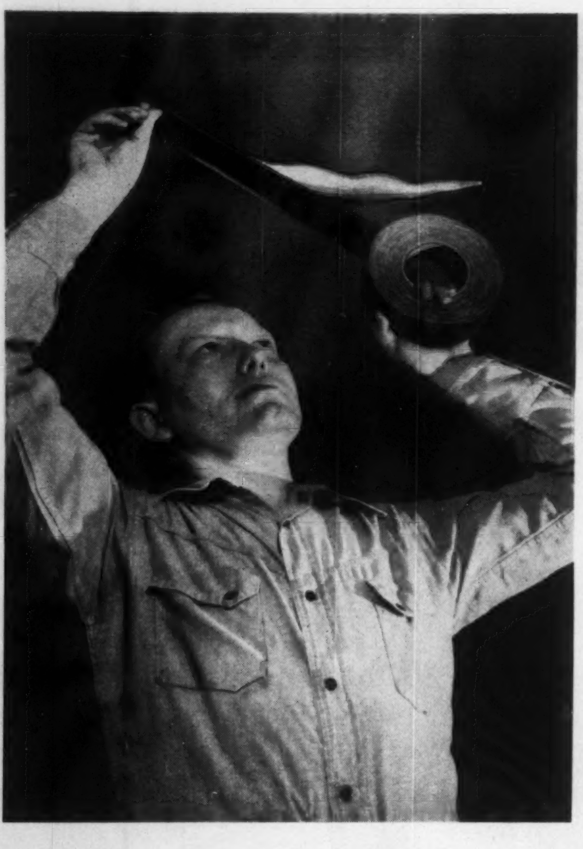
The motor with the built-in hush ...Westinghouse Life-Line A

Tests prove the Life-Line® "A" motor is the quietest available for air-conditioning applications and other places where motors must be quiet. Studies in soundproof laboratories prove the operating sound level of these Life-Line "A" motors is lower than any other standard motor.

Precision manufactured parts, dynamically balanced, assure dependable service. Possible vibration is minimized by rugged mounting of this smooth-running Westinghouse motor. Pre-lubrication coupled with Life-Line "A" fortified insulation and close-tolerance machining offers the nearest thing to a maintenance-free motor available.

For further information on the Life-Line "A" motor, call your Westinghouse sales engineer or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21996

YOU CAN BE SURE...IF IT'S Westinghouse



Quickest and Surest Way to Seal Ducts and Insulation

Use a handy roll of Arno Ductape. It sticks instantly and permanently to any surface. For irregular or difficult-to-reach joints tear the tape off in strips for easy application. Where extra safety against fire hazard is needed use Arno F-R (Flame-Resistant) Ductape.

Arno Ductape comes in 60-yard rolls 1, 1½ and 2 inches wide (or wider if needed). Colors are black, tan, olive drab and aluminum gray. It's specially made for duct sealing and other heavy duty jobs.

If you haven't yet tried Arno Ductape ask your jobber or write for a sample roll. You'll like it and the time it saves.

Sales Offices

Atlanta—2258 B Cascade Rd. S.W.
Chicago—5577 Northwest Highway
Denver—1376 5th Street
Detroit—12915 W. Eight Mile Road
Fort Worth—2724 Tillar Street
Los Angeles—3225 East 46th Street
Minneapolis—401 Plymouth Ave. North
New York—104 West 17th Street

Arno
ADHESIVE TAPES, INC.
Subsidiary of The Scholl Mfg. Co., Inc.

Arno Adhesive Tapes, Inc., 4140 Ohio Street, Michigan City, Indiana

WE HEAR THAT . . .

▶ *FRANK F. ELLIOT*, chairman of the board of directors of *CRANE CO.*, has announced his retirement April 30. He has completed 36 years of service with the company.

▶ *HANDY & HARMON* has opened a new plant at El Monte, Calif., designed for the fabrication and recovery of precious metals and their alloys. The new plant has a total area of 25,200 sq ft.

▶ *GENERAL WATERWORKS CORP.* has purchased one third of the outstanding common stock of *COCHRANE CORP.* from minority interests.

▶ Specialty products sales section of the *"FREON" PRODUCTS DIV.* of *E. I. DU PONT DE NEMOURS & CO.* has been renamed the *FLUORO SOLVENTS AND CHEMICALS* section.

▶ *POWER FLAME DIV.* of *SIMEON MFG. CO.* has completed a move to larger facilities in Grandview, Mo. The 15,000 sq ft building houses the administrative offices and all production departments.

▶ *CONTROLS CO. OF AMERICA* has purchased from *BREESE BURNERS, INC.* certain assets consisting of laboratory equipment, materials, designs, products and United States, Canadian and foreign patents.

▶ Construction has begun on a 10,000 sq ft Pittsburgh regional headquarters building for the combined activities of *SQUARE D CO.* and *ELECTRIC CONTROLLER & MFG. CO.* It is scheduled for completion in early summer.

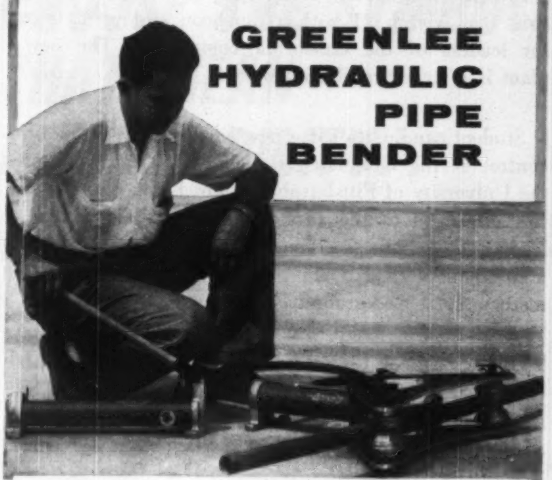
▶ *YOUNGSTOWN SHEET AND TUBE CO.* has broken ground for a new sintering plant at its Indiana Harbor Works in East Chicago. The new plant is designed for a capacity of 4200 net tons of sinter products daily, with provisions for doubling output later.

▶ Contracts have been let for a $175,000 addition to the *DUNKIRK RADIATOR CORP.* plant. The addition is intended to house production stamping facilities to manufacture jackets for the company's products.

▶ *MASON PRODUCTS, INC.* is a new company for the design and production of water cooling towers for use with commercial and industrial air conditioning systems. Offices will be maintained at 317A Main St., West Concord, Mass. Cooling towers from 8 to 75 tons are now in production.

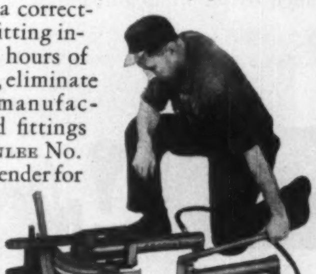
save time, cut costs on your piping installations with lightweight, portable

GREENLEE HYDRAULIC PIPE BENDER



easy, fast operation makes 90° bend with one ram stroke

Quickly produce your own bends in cold pipe *right on the job* . . . exactly the way you want them, to make a correct-working, neat-fitting installation. Save hours of time, save labor, eliminate cost of many manufactured bends and fittings with the GREENLEE No. 880 Hydraulic Bender for ½" to 2" pipe. Easily carried and operated by *one man*. Accurate . . . makes bends to just the angle required. Fast . . . *a complete 90° bend made with one ram stroke*. Radius attachment also available for making radiant heating 180° return bends in tubing and pipe. Powerful . . . 15 tons of ram force! Easily operated by hand, or may be teamed with a GREENLEE power pump for production-line bending either in your shop or out on the job. GREENLEE line also includes larger hydraulic benders for pipe up to 5" and hand benders for tubing and small pipe. Get the complete story on how you can speed your work, make better installations, and cut job costs with a GREENLEE Bender. Write for folder E-221.



TOOLS FOR CRAFTSMEN
GREENLEE

GREENLEE TOOL CO.
2345 12th Street, Rockford, Illinois

DO YOU FIND YOUR PUMP PROBLEM HERE?

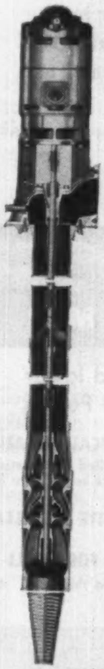
A
- Water Supply
- Air Conditioning
- Refrigeration
- Cooling Towers
- Sump Pumping, Etc.

B
- Booster Service
- Cooling Towers
- Water Treatment
- Water Circulation
- Brine Service, Etc.

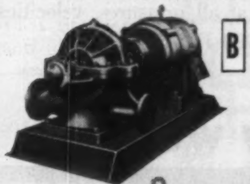
C
- Hot Water Circulation
- Ice Water or Brine
- Clear Water
- Boilers
- Booster Service, Etc.

D
- Hot and Cold Liquids
- Refrigerants
- Boiler Feed
- Cooling Towers

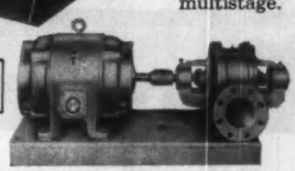
Then You'll Find Your Best Answer Here—



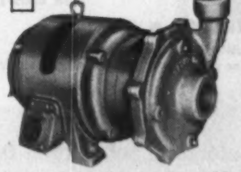
A **F-M Pomona Water-Lubricated Turbine Pumps**
Easily installed, easy to adjust for varying field conditions. Available with wide choice of drivers.



B **F-M Split-Case Centrifugal Pumps**
Capacities, pressures and sizes for any requirements. Single-stage or multistage.



C **F-M Westco Peripheral Pumps**
Capacities to 200 gpm. Pressures to 900 ft. Sizes 1½" through 2½". Horizontal single-stage or multistage. Develops high pressure at normal operating speeds.



D **F-M Builtogether Centrifugal Pumps**
Capacities to 900 gpm. Pressures to 525 ft. Sizes ¾" through 5". Single-stage or multistage.

***FREE!* Expert Engineering Help at Your Service**

Be *sure* of low-cost, foolproof pumping installations that match your exact requirements . . . call in your Fairbanks-Morse Sales Engineer. Take advantage of his broad technical background and expert knowledge of pumps for air conditioning, plumbing and heating. Call him today, or write Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago 5, Illinois.

FAIRBANKS-MORSE
a name worth remembering when you want the BEST

PUMPS • SCALES • DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY
RAIL CARS • HOME WATER SERVICE EQUIPMENT • MAGNETOS

WE HEAR THAT

Continued

▶ Sam Horwitz, president of *MIDCONTINENT TUBE SERVICE, INC.*, announced the formation of an affiliated company, *MIDCO VALVES & FITTINGS, INC.*

▶ A new assembly line to provide flow of compressors up to 150 tons was announced by the Air Conditioning and Refrigeration Div. of *WORTHINGTON CORP.*

▶ *OHIO INJECTOR CO.* has initiated a management training course with 25 selected members of the manufacturing department enrolled in classes in industrial engineering, methods design, manufacturing practice.

▶ *FULTON SYLPHON DIV.* of *ROBERTSHAW-FULTON CONTROLS CO.* has opened a product development laboratory in Knoxville, Tenn. Research activity will be devoted to the creation of new products.

▶ *UNITED ELECTRIC CONTROLS CO.* has announced the addition of *AEROTECH SPECIALTIES, INC.*, Box 127, Glastonbury, Conn., as a subsidiary. The company is a manufacturer of probes for measuring velocity, direction, pressure and temperature of gases and liquids at all pressures, velocities and temperatures up to 2000 F.

▶ *NATIONAL CYLINDER GAS CO.* has announced that the company's directors have voted that the company name be changed to *CHEMITRON CORP.* Stockholders have been asked to approve the new name.

▶ *FLEXONICS CORP.* formally opened its new Santa Ana Div. March 21 with a luncheon and plant tour for leaders of the California community. The new plant is a structure of 25,000 sq ft.

▶ Student candidates for a new course in air pollution control at the Graduate School of Public Health of the University of Pittsburgh are now being considered for admission to the 1958-59 program. The course, leading to an M.S. in Hygiene, is open to engineers and others with B.S. in physical sciences having a mathematical background.

▶ "The School of Living Comfort," operated by *BELL & GOSSETT CO.* has graduated its 50th class. The school teaches the design of circulated water heating and cooling systems.

▶ The bituminous coal industry has announced that the major coal research center planned for Bituminous Coal Research, Inc. will be built in the Pittsburgh area in the University Park development in Monroeville borough of suburban Pittsburgh.

the new weil

SUBMERSIBLE

SUMP PUMP

A PACKAGED UNIT . . . priced lower than many conventional Sump Pumps

OPERATES UNDER WATER ●
Hermetically sealed motor with a leak-proof rotating shaft seal assures dependable performance at all times.

FOR FLOOD-PROOF OPERATION ●
If current fails moisture cannot damage pump or motor.

FOR ECONOMICAL INSTALLATION ●
Is easily installed in a metal tile or concrete sump 2' to 8' deep.

FOR GAS-TITE INSTALLATIONS ●

FOR SMALL SUMPS ●
Can be installed thru a 15" opening.

Built for – Automatic Submerged Operation

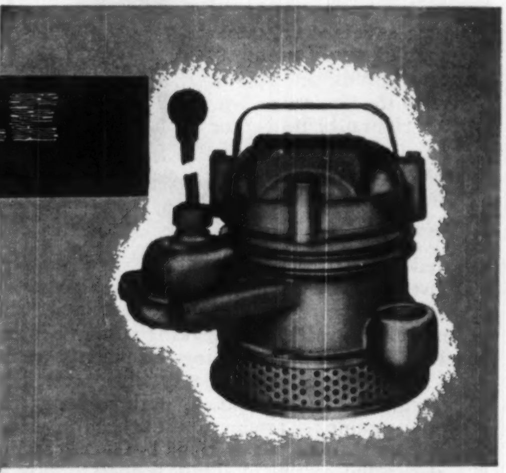
CHOICE OF 3 CONTROLS

NEW MICRO SWITCH MODEL SS-800 ILLUSTRATED

MICRO-SWITCH ●
Fool-proof and trouble-free.

ELECTRODE ●
For special installations.

FLOAT SWITCH ●
For Duplex Units.



MOTOR: 1/3 HP, 1750 RPM, 110 volt **CAPACITOR TYPE** with 8 ft. waterproof cable and plug
IMPELLER: Bronze
SCREEN: Brass
BASE: Sturdy cast-iron
DISCHARGE: 1¼"
SHAFT: Stainless steel
DIMENSIONS: Height: 12¾"; Diameter: 11"; Weight: 50 lbs.

Engineered for One Million Starts

weil PUMP CO.

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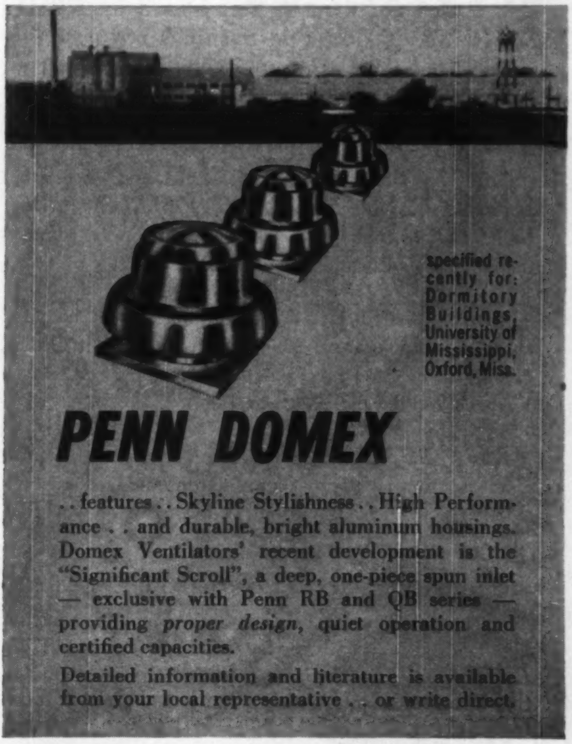
when you choose roof ventilation equipment,

CHOOSE THE SYMBOLS THAT MEAN DEPENDABILITY..

PENN VENTILATOR

CERTIFIED RATINGS
AMCA

Penn is proud to feature the AMCA symbol .. it's your assurance that Penn Ventilators have met the rigid standards of quality performance in accordance with our published ratings.



specified recently for: Dormitory Buildings, University of Mississippi, Oxford, Miss.

PENN DOMEX

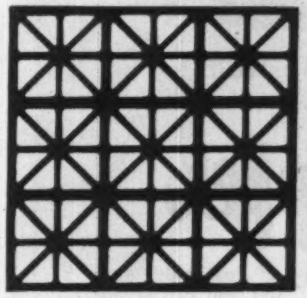
.. features .. Skyline Stylishness .. High Performance .. and durable, bright aluminum housings. Domex Ventilators' recent development is the "Significant Scroll", a deep, one-piece spun inlet — exclusive with Penn RB and QB series — providing *proper design*, quiet operation and certified capacities.

Detailed information and literature is available from your local representative .. or write direct.

PENN VENTILATOR CO., INC.
PHILADELPHIA 40, PA.
Representatives and Distributors in Principal Cities
Member of the Air Moving and Conditioning Assoc.

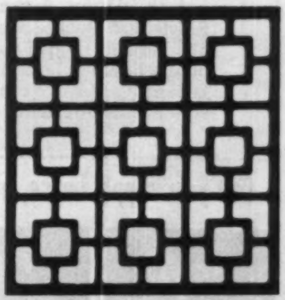
THINK OF HENDRICK for ARCHITECTURAL GRILLES

more than 100 designs to choose from



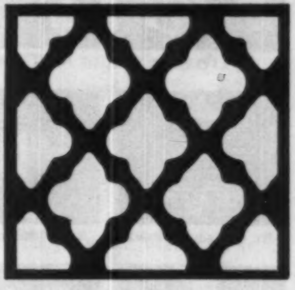
ATTRACTIVE

Hendrick Architectural Grilles combine the functional with the decorative. Many designs are obtainable only from Hendrick.



ECONOMICAL

Hendrick Grilles cost less to install and maintain than most architectural materials.



VERSATILE

Each design can be furnished in a wide range of dimensions, with varying numbers and sizes of perforations.

EASY TO INSTALL

Hendrick Grilles always lie flat . . . do not bend or warp. They provide more than enough room for free passage of air.

Write today for more information about Hendrick Grilles.

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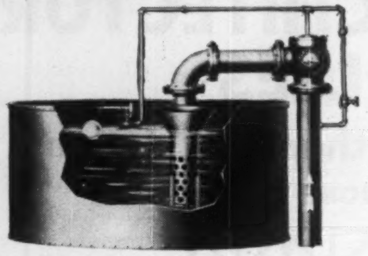
Manufactring Company
48 Dundaff Street, Carbondale, Pa.

Perforated Metal • Perforated Metal Screens • Wedge-Slot Screens • Hendrick Wedge Wire Screens • Architectural Grilles • Mitco Open Steel Flooring—Shur-Site Treads • Armorgrids • Hydro Dehazers • Distillation Chemical Column Internals

If you have a
liquid level control problem

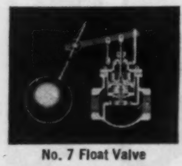


call for a valve from

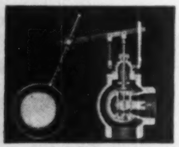
Klipfel

No matter what type of float valve you want, Klipfel has it. And you can get it quickly. Direct Action and Pilot Control, Single and Double Seated Float Valves are all available to give automatic level control of any liquid in large as well as small installations. Valves of special design, and/or corrosion-resistant materials built promptly.

Call your supply house, or write for Bulletin 254.



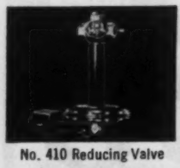
No. 7 Float Valve



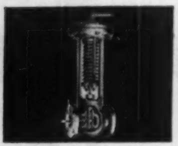
No. 27 Float Valve

AIR MAIL

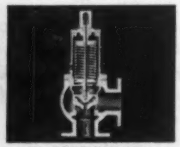
Most items shipped within 24 hours after order is received



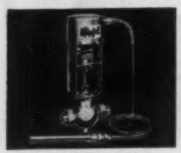
No. 410 Reducing Valve



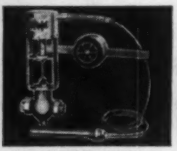
No. 300 Reducing Valve



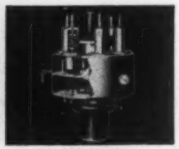
No. 135 Relief Valve



No. K-449 Temperature Regulator Valve



No. K-348 Temperature Regulator Valve



No. 135 Multiport Relief Valve

HAMILTON • OHIO **Klipfel** VALVES INC.

Automatic Temperature-and-Pressure-Regulating Valves Since 1902

Float Valves • Temperature Regulators • Back Pressure Valves • Reducing Valves

A DIVISION OF THE HAMILTON-THOMAS CORPORATION

WE HEAR THAT

Continued

▶ *ALLIS-CHALMERS MFG. CO.* has opened a seven story, 110,000 sq ft office building directly across the street from the firm's main office in West Allis, Wis.

▶ *HOWELL ELECTRIC MOTORS CO.* and *OHIO ELECTRIC MFG. CO.* are now conducting merger negotiations.

▶ *TRANTER MFG., INC.*, has expanded its laboratory floor space by 300 percent. Problems of heat control will be studied in the newly expanded laboratory space.

▶ *DEMING CO.* has recently inaugurated the "Deming Pump School," a four day lecture and workshop instruction period with selected industrial distributor salesmen as students.

▶ *TRANE CO.* has announced completion of its $700,000 research and testing center expansion, providing 35,000 sq ft of testing area.

New and larger laboratory facilities for research and development have been established by *SPRAY ENGINEERING CO.* at the company's new plant site in Burlington, Mass. The new facilities include laboratories for hydrodynamics and air atomizing spray equipment.

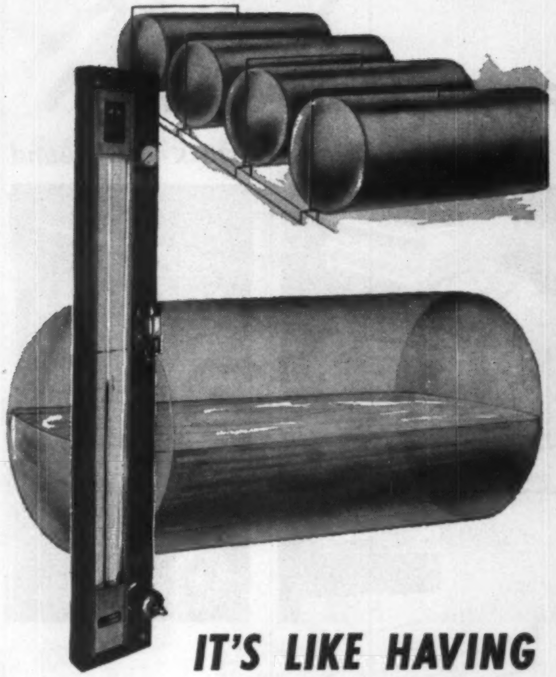
CARLON PRODUCTS CORP. has announced the acquisition of the *PLASTIC INDUSTRIAL PRODUCTS CO.* of Somerville, Mass. It will operate under the company's Custom Extrusion Div.

JOHN J. NESBITT, INC. has announced the purchase of a three story, 70,000 sq ft building in Philadelphia to be used for an expansion of the company's research and development program.

BARNEBEY-CHENEY CO. has announced the purchase of the rights to manufacture and sell carbon wool, a new form of carbon in the form of wool-like fibers.

The completion of a new 10,000 sq ft research laboratory at Ampere, N. J., has been announced by the air conditioning and refrigeration div. of *WORTHINGTON CORP.* The new facilities are intended for the development and testing of packaged air conditioning products.

A new research laboratory was dedicated by the *NATIONAL CLAY PIPE MANUFACTURER'S ASSOCIATION*. The new laboratory is already engaged in research activities intended to improve the qualities of clay pipe used in heating and air conditioning ducts. ‡



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When you use

PETROMETER

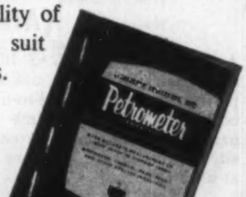
REMOTE READING

LIQUID DEPTH INDICATORS

You can read the Petrometer Liquid Depth Indicator with as much confidence as if you were looking directly into your tank. It's accurate and reliable . . . operates on the principle of hydrostatic pressure.

Unique construction of Petrometer indicators makes installation easy . . . and unitized design of all working parts permits wide flexibility of multi-gauge panel design to suit your installation requirements.

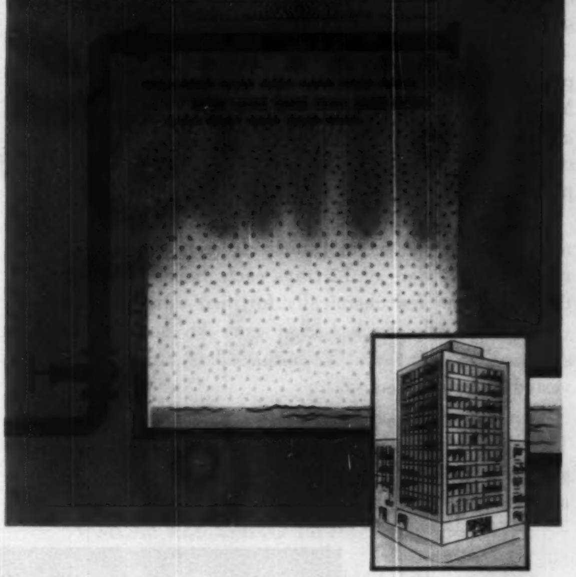
Complete information is available in our Bulletin 6004. Send today for your copy.



PETROMETER CORP.
43-22 TENTH ST.
LONG ISLAND CITY 1, N. Y.

Oakite Airefiner No. 52 in water

GIVES YOU TROUBLE-FREE AIR CONDITIONING—3 WAYS



Properly treated water in air conditioning systems goes a long way in prolonging equipment life, improving operating efficiency and keeping systems trouble-free. A small amount of Oakite Airefiner No. 52 added to cooling tower water does all this—and more! A softening and purifying material, Airefiner No. 52:

1. **Checks growth of pipe-blocking, jet-clogging algae and slime**
2. **Prevents build-up of insulating scale**
3. **Minimizes metal-eating corrosion**

Try Oakite Airefiner No. 52 in your water system and see the difference in lower maintenance costs, more efficient cooling, less out-of-service time.

THIS MAINTENANCE MANUAL gives complete details on cleaning and maintaining air conditioning and refrigeration systems at less cost. For your free copy, write Oakite Products, Inc., 51B Rector Street, New York 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING
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MATERIALS · METHODS · SERVICE
SCIENCE

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Technical Service Representatives in Principal Cities of U. S. and Canada

ON THE JOB

Air Conditioning Helps Provide Fresh Fodder

. . . for Texas livestock year 'round

ROOM AIR CONDITIONERS are playing a vital part in a packaged greenhouse now being used in Texas and other parts of the Southwest to produce between 350 and 500 lb of feed daily in an area only 8 ft square, according to Carrier Corp.

Close control of temperature and humidity has been proved an essential part of the new growing method. Many previous commercial efforts in this type of "tray agriculture" — hydroponic farming — have failed because moisture induced fungus killed otherwise healthy plantings.

The greenhouse consists of double glassed windows mounted in large metal frames. It includes 72 trays arranged in six tiers of 12 trays each. Seeds are placed in the trays, and fed chemically fortified water daily to accelerate growth. Each basket may be harvested every six days, meaning that 12 baskets daily are usually harvested and replanted.

The air conditioning unit is outside the greenhouse. The air enters the greenhouse and is blown across a 100 gal vat of chemically treated water which is used to feed and irrigate the planting. The tanks are uncovered to maintain the humidity between 70 and 90 percent.

Optimum growth temperature is between 68 and 70 F. To maintain the temperature at this level, the conditioner recirculates the air every 80 seconds. ⧧

POWER OR ATMOSPHERIC

Multuri Burners

that EXCEED Standards of

EFFICIENCY! PERFORMANCE! SAFETY!

Power Multuri burners available in standard units with input capacities to 19,600,000 BTU's. Larger burners or special adaptations available.

Multuri Burners available in 4 to 54 mixers. Standard capacities 700,000 to 9,450,000 BTU/hr. Higher capacites available.

GORDON BYDAND

ROBERTS-GORDON POWER MULTURI GAS BURNERS

Ideal for commercial and industrial boilers, such as scotch marine, steel firebox, downdraft, refractory types, warm air furnaces, drying units, etc. Power Multuri burners can often be used in conjunction with presently installed stokers or oil burners, permitting quick changeover to auxiliary standby fuel, and can be operated with natural or induced draft.

ROBERTS-GORDON MULTURI (Atmospheric) BURNERS

A PREMIX TYPE GAS BURNER, ideal for commercial and industrial size boilers and warm air furnaces. Gives maximum performance from hard-to-fire Scotch Marine and steel fire box boilers. Controlled flame characteristics make the burner a natural for units with extensive refractory surface. Suitable for any gas at 4" gas pressure or more. Permits high firing rates at high efficiency.

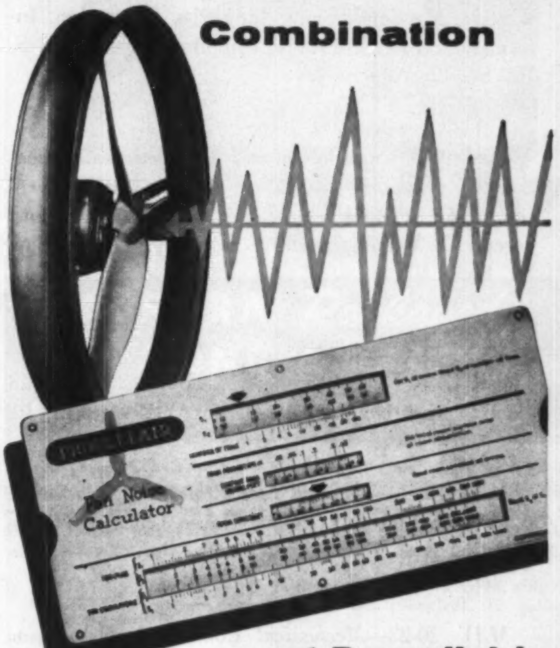
Multuri Burners are completely wired and Assembled — Ready for Immediate Installation. Simple to Install, Adjust, Operate !

Write for detailed information—or for a questionnaire listing all the data necessary for correct specifications and efficient installation.

ROBERTS-GORDON Appliance Corp.
44 CENTRAL AVE. BUFFALO 6, N. Y.
In Canada . . . ROBERTS-GORDON APPLIANCE CORP., LTD., *Grimsby, Ont.*

Gas Heating Equipment
- FURNACES
- COOLING UNITS
- BOILERS
- UNIT HEATERS
- GAS BURNERS

New! Simple Slide Rule Accurately Specifies Quietest Fan Combination



get Propellair's new Fan-Noise Calculator

The Fan-Noise Calculator permits prediction of resultant noise that one or more fans will make in rooms of any particular dimensions, construction and accoustical treatment.

Propellair's sone rating system for fans is simple and easily understood. It's based on frequency spectrum noise analysis plotted against the actual effect on the human ear. The sone system is far superior to inaccurate and improperly used decibel ratings . . . permits realistic direct noise comparisons (ten sones are twice as loud as five sones, etc.).

Now you can specify the quietest fan combination your room requires. Order your Fan-Noise slide rule calculator today! Send $1.00, with your name and address, to Propellair Division, Dept. HP, Robbins & Myers, Inc., Springfield, Ohio.

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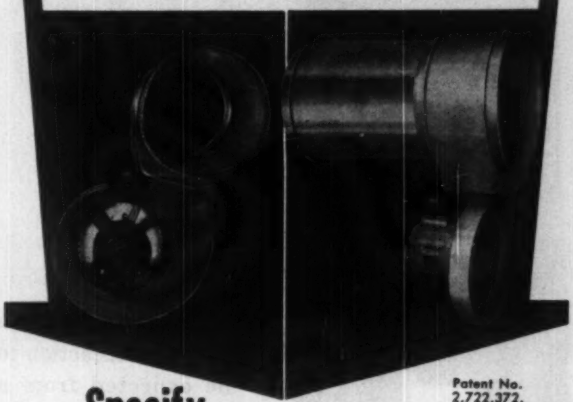
MOVING AIR IS OUR BUSINESS®

FOR LOW COST HEATING PLANT POWER-DRAFT AND INDUSTRIAL EXHAUSTING



Patent No. 2,722,372.
Other Patents Pending.

...Specify

Quickdraft

★ NO MOTORS, FANS OR BEARINGS IN EXHAUST LINE ★ NEEDS NO STACKS ★ ACID RESISTING FINISHES ★ STATIC PRESSURE UP TO 20 INCHES

FOR HEATING PLANTS AND INCINERATORS, Quickdraft provides constant draft for efficient and economical combustion. It eliminates pulsating or chattering, puffing, smoking and sooting. Costly, tall and unsightly stacks are unnecessary.

FOR INDUSTRY, Quickdraft offers up to 20 inches static pressure for exhausting corrosive gases, abrasives and paint spray . . . moving fine bulk materials and wastes.

FOR MOVING AIR . . . in or out of building through ducts . . . Quickdraft is outstanding.

N-888-QD

IMPORTANT NOTICE

For withstanding corrosive gases, all Quickdraft units are available in standard acid resisting vitreous enamel, No. 316 Stainless Steel, rigid plastics (P.V.C.) and with plastic and Fiberglas coatings.

Write for QUICKDRAFT ENGINEERING DATA on your application . . . today.

Quickdraft CORPORATION

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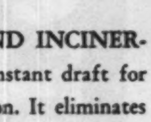
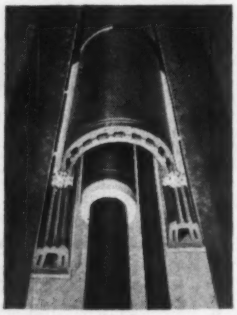


proven thermal efficiency!

Some idea of the high level of satisfaction to be expected from a Therm-O-Tile installation can be gained from noting the results obtained from a test conducted on an actual Therm-O-Tile conduit line: 95.7% thermal efficiency! The installation tested was a typical one, completed under contract. The test was thoroughly documented and affords interesting reading. Write for your copy of test results.



Therm-O-Tile®
conduit system
FOR UNDERGROUND PIPING

H. W. PORTER CO., INC. — NEWARK 12, NEW JERSEY
or Subsidiary
REID HAYDEN, INC.—BALTIMORE • CHARLOTTE • RICHMOND

MEETINGS & CONVENTIONS

1958

MAY 7-11—*Western Air Conditioning, Heating, Ventilating and Refrigeration Exhibit and Conference.* Shrine Exposition Hall, Los Angeles. Sponsored by Western Air Conditioning Industries Association. Information: Fred J. Tabery, exhibit manager, 3443 S. Hill St., Los Angeles 7.

MAY 8-10—*Sheet Metal and Air Conditioning Contractors' National Association, Inc.*, annual convention. Eden Roc Hotel, Miami Beach. Information: Joseph D. Wilder, executive secretary, 170 Division St., Elgin, Ill.

MAY 11-14—*Fluid Controls Institute, Inc.* Lake Placid Club, Lake Placid, N. Y. Information: Fluid Controls Institute, Inc., P. O. Box 191, Decatur, Ill.

MAY 19-23—*National Fire Protection Association*, 62nd annual meeting. Palmer House, Chicago. The association is at 60 Batterymarch St., Boston.

MAY 20-23—*Mechanical Contractors Association of America, Inc.*, 69th annual convention. Ambassador Hotel, Los Angeles. Information: MCAA headquarters, 45 Rockefeller Plaza, New York 20.

MAY 21-23—*Power Division of the Instrument Society of America*, conference on "Energy Instrumentation Today and Tomorrow." New York. Information: Thomas K. Hodges, Instrument Society of America, 313 Sixth Ave., Pittsburgh 22.

JUNE 2-5—*National District Heating Association*, 49th annual meeting. French Lick-Sheraton Hotel, French Lick, Ind. Information: John F. Collins, Jr., secretary-treasurer, 827 N. Euclid Ave., Pittsburgh 6.

JUNE 9-13—*Fourth International Automation Exposition and International Automation Congress.* Coliseum, New York. Information: Richard Rimbach Assoc., 845 Ridge Ave., Pittsburgh 12.

JUNE 9-13—*Seminar on Electrical Precipitation Equipment.* Pennsylvania State University. Information: Extension Conference Center, Pennsylvania State University, University Park, Pa.

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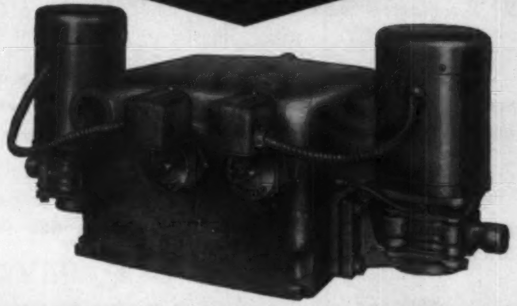
and
DUPLEX



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The advanced COND-A-PAC is a packaged unit, ready to hook to piping and line leads. It is NEW — with LOW NPSH characteristics — compact, efficient and quiet — very low return — self venting to prevent vapor lock — designed for best performance on hot water service — and is ideal for AIR CONDITIONING duty.

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20 PSI DISCHARGE PRESSURE
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3,500 RPM

A 500-4,000 EDR unit capacity 8 GPM with receiver capacity 6 gallons (Simplex), 12 gallons (Duplex), 1/6 HP.

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TOP PERFORMANCE ASSURED by MANY VALUE FEATURES

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OTHER AURORA RETURN UNITS

Aurora Condensation Return Units are of a variety to fully meet practically every situation in automatic return to low and high pressure boilers of the hot water condensation from radiators, coils, etc. — or return of water and other liquids to the overhead tanks of gravity circulating systems in industry. WHATEVER YOUR RETURN PROBLEM, AURORA CAN HANDLE IT.

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PIPE HANGERS

FOR

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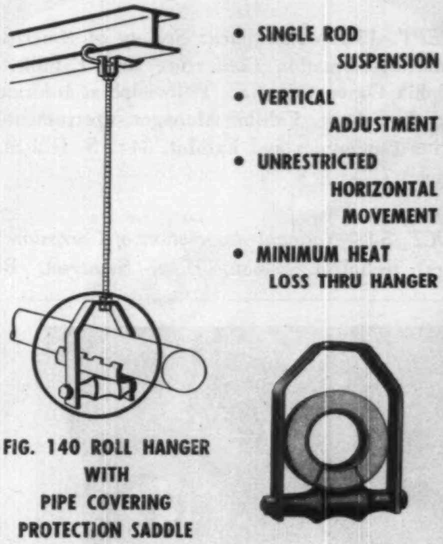

- SINGLE ROD SUSPENSION
- VERTICAL ADJUSTMENT
- UNRESTRICTED HORIZONTAL MOVEMENT
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FIG. 140 ROLL HANGER WITH PIPE COVERING PROTECTION SADDLE

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MEETINGS & CONVENTIONS *Continued*

1958

JUNE 22-27—*American Society for Testing Materials*, 61st annual meeting. Hotels Statler and Sheraton-Plaza, Boston. ASTM headquarters: 1916 Race St., Philadelphia 3.

JUNE 23-25—*American Society of Heating and Air-Conditioning Engineers, Inc.* and *American Society of Refrigerating Engineers*, simultaneous meeting. ASHAE meeting at Pick-Nicollet Hotel, Minneapolis. ASHAE headquarters: 62 Worth St., New York 13. ASRE meeting at Hotel Leamington, Minneapolis. ASRE headquarters: 234 Fifth Ave., New York 1. For further details see page 182.

SEPT. 15-19—*Instrument Society of America*, Instrument-Automation Conference and Exhibit. Philadelphia Convention Hall, Philadelphia. Information: Fred J. Tabery, Exhibit Manager, Instrument-Automation Conference and Exhibit, 3443 S. Hill St., Los Angeles 7.

OCT. 5-8—*National Association of Corrosion Engineers*, technical session. Hotel Somerset, Boston. NACE headquarters: 1061 M & M Bldg., Houston 2.

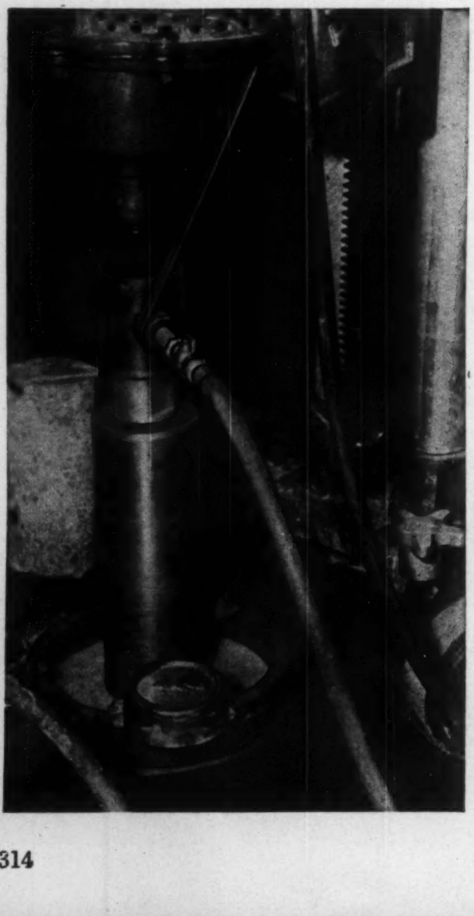
OCT. 13-15—*National Electronics Conference*, conference and exhibition. Hotel Sherman, Chicago. Information: Rudolph E. Hornacek, Publicity Committee Chairman, c/o Illinois Bell Telephone Co., 208 W. Washington St., Chicago 6.

OCT. 16—*American Gas Association*, annual convention. Atlantic City. AGA headquarters: 420 Lexington Ave., New York 17.

OCT. 20-24—*46th National Safety Congress & Exposition*, Chicago. National Safety Council, 425 N. Michigan Ave., Chicago 11.

OCT. 22-24—*Air-Conditioning and Refrigeration Wholesalers Association*, annual meeting. Sheraton-Palace Hotel, San Francisco. Information: 2607 N. High St., Columbus, Ohio.

NOV. 17-21—*Society of the Plastics Industry, Inc.*, eighth national plastics exposition. International Amphitheater, Chicago. To be held concurrently with the SPI annual national conference, Morrison Hotel, Chicago. SPI headquarters: 250 Park Ave., New York 17.



TIME FOR DRILLING 3½" HOLES THROUGH 10" REINFORCED MERAMEC GRAVEL CONCRETE FLOOR CUT FROM 6 HOURS TO 30 MINUTES

JOB: Cut 150 holes 3½" diameter through 10" concrete floors for new conduit feeders in the warehouse section of the old Mart Building, now the St. Louis Area Support Center, St. Louis, Mo. The Building, constructed in 1932, was built of concrete containing Meramec gravel aggregate—"the next thing to flint". Chiseling these holes would have resulted in jagged and uneven holes, much dirt and noise, a big clean-up job and much patching to finish up the job and would have averaged six hours each for two men.

CONTRACTOR: The Sachs Electric Corporation, St. Louis, Mo.

TOOLS: Model C Truco Diamond Drilling Machine with 350 rpm motor and 3½" O.D. Truco Diamond Drill Bit.

DESCRIPTION: Truco unit was used mounted on its mobile base and moved to location on its rubber tired wheels. Actual drilling time on each hole was from 6 to 9 minutes depending upon the number of reinforcing rods to be cut. Each completed hole averaged 30 minutes including all moving, set-up and core removal. (Compare with previous 6 hours for two men with air hammers.) Completed hole was clean and smooth and no patching needed. Truco unit is completely portable by one man and is designed for high speed drilling in practically any location. Wired for 110 V, 60 cycles or less.

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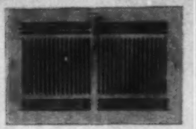

551 PERIMETER WALL AND BASEBOARD REGISTERS

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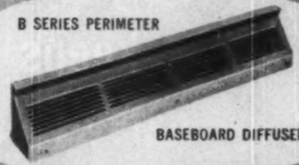

BASEBOARD DIFFUSERS

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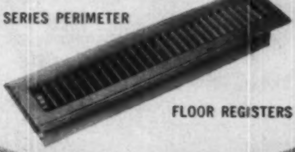

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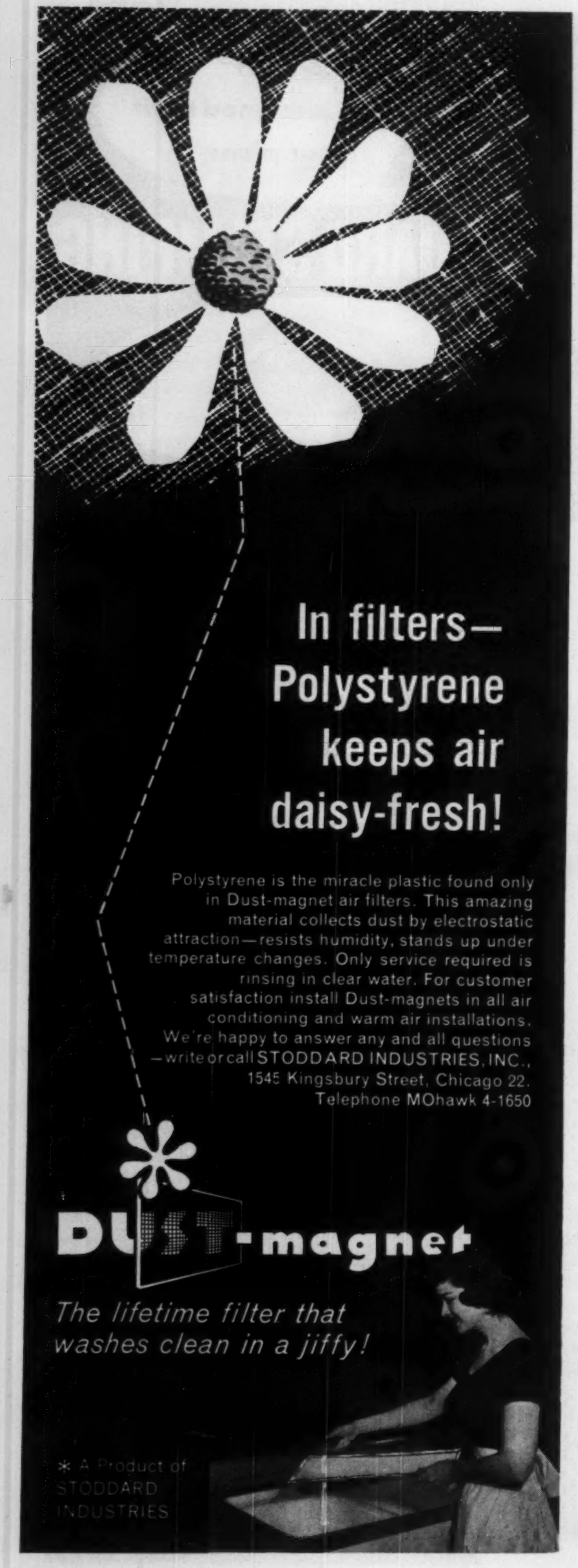
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MEETINGS & CONVENTIONS

Continued

1959

JAN. 26-30—*14th International Heating and Air-Conditioning Exposition.* Philadelphia. Under auspices of the American Society of Heating and Air-Conditioning Engineers, in conjunction with its 65th annual meeting, also in Philadelphia. Exposition management: International Exposition Co., 480 Lexington Ave., New York 17. ASHAE headquarters: 62 Worth St., New York 13.

APRIL 1-3—*Gas Appliance Manufacturers Association*, annual meeting. The Greenbrier, White Sulphur Springs, W. Va. GAMA headquarters: 60 E. 42nd St., New York 17.

APRIL 5-9—*Edison Electric Institute*, annual convention. New Orleans. EEI headquarters: 420 Lexington Ave., New York 17.

MAY 18-22—*National Fire Protection Association*, annual meeting. Hotel Statler, New York. NFPA headquarters: 60 Batterymarch St., Boston. ⌗

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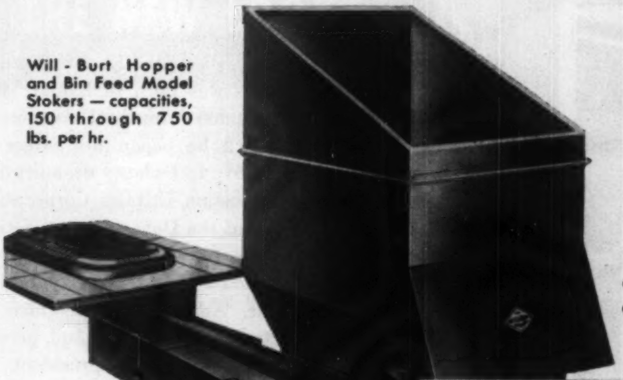

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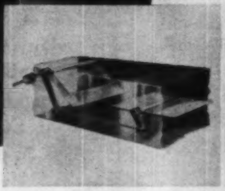

W-B Automatic Air Control — sensitively controls air supply — prevents excessive soot or smoke.

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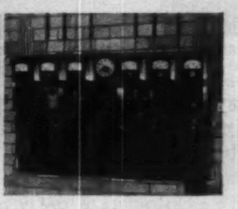

W-B Panel Controls — make scheduled heating a simplified, supervisory operation — tailored to the job.

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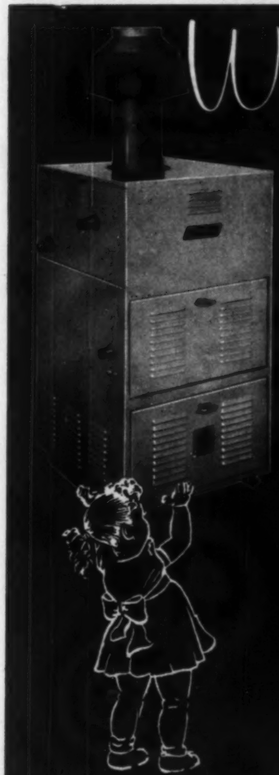
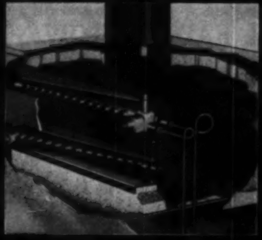


"Light as a feather"



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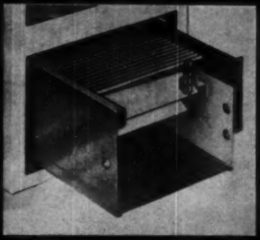

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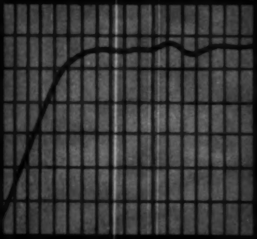

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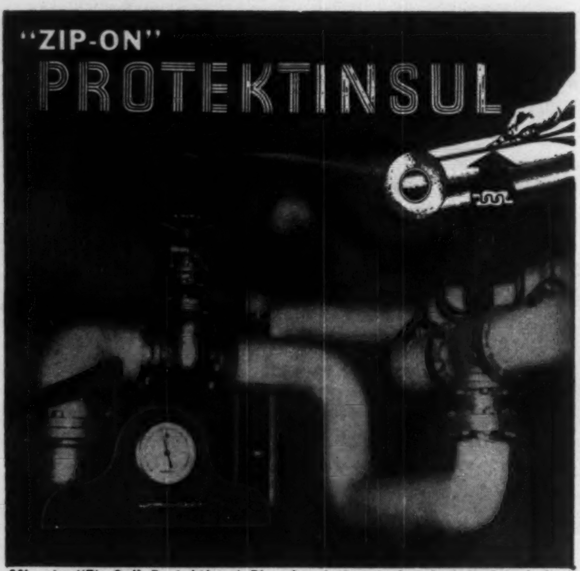

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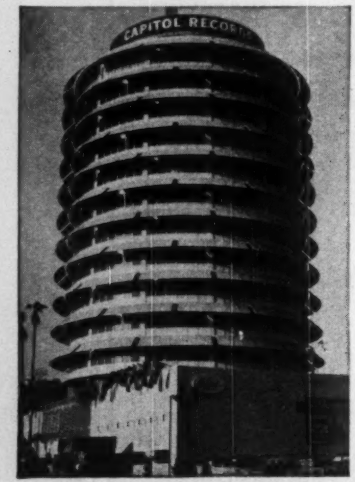
Obituary

Frank H. Adams

Frank H. Adams, 72, president of Surface Combustion Corporation, Toledo, died on Easter Sunday, April 6, 1958. Mr. Adams was born in Lamar, Mo., March 28, 1886 and graduated from the University of Missouri in 1908. In 1912 he began his career as project engineer in the Henry L. Doherty organization. When, in 1923, the Combustion Utilities Corporation, a gas research subsidiary of the Doherty organization, was founded in New York, he was elected vice president and treasurer. In 1924 H. L. Doherty bought Surface Combustion. Mr. Adams was appointed its first treasurer and elected vice president and general manager in 1926. In 1941 he became president. He was a charter member of the Institute of Gas Technology, formed in Chicago in 1939, and served for a number of years on the executive committee of that research organization. He was president of the Industrial Furnace Manufacturers in 1929-30 and of the Gas Appliance and Equipment Manufacturers in 1939-40. Mr. Adams served on the national board of the American Gas Association from 1937 to 1940, and in 1945 was elected head of AGA's manufacturers' section.



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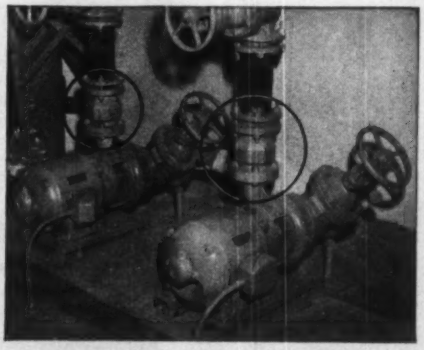

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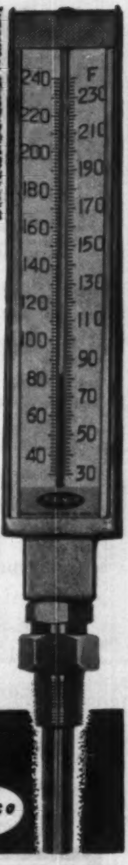

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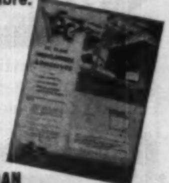

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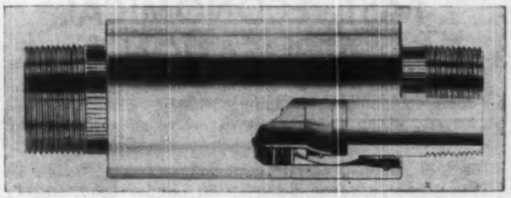

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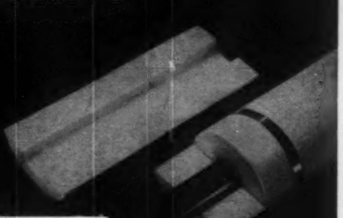

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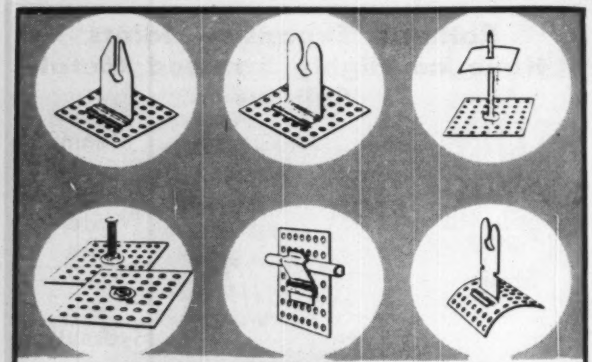

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Bibliographic Survey of Corrosion—Compiled by A. Irene Humphrey. 468 pp. National Association of Corrosion Engineers, 1061 M & M Building, Houston 2, Texas. $20.00.

Air Conditioning and Refrigeration—By William H. Severns and Julian R. Fellows. 564 pp. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16. $10.25.

1958 Manufacturers' Guide—150 pp. Manufacturers' Agent Publishing Co., 505 Fifth Ave., New York 17. $10.00.

Industrial Noise Manual—Compiled by the Noise Committee of the American Industrial Hygiene Association. 107 pp. American Industrial Hygiene Association, 14125 Prevost, Detroit 27. $7.50.

Industrial Ventilation Manual. Fifth Ed. American Conference of Governmental Industrial Hygienists, Committee on Industrial Ventilation, P.O. Box 453, Lansing 2, Mich. $4.00

Proceedings of the American Power Conference, Volume XIX. 746 pp. Illinois Institute of Technology Center, Chicago 16. $8.00.

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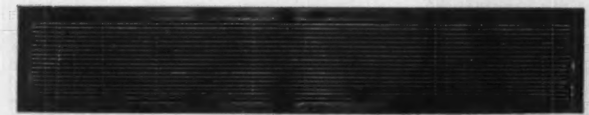

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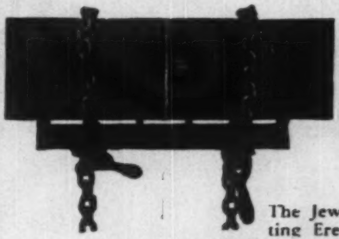

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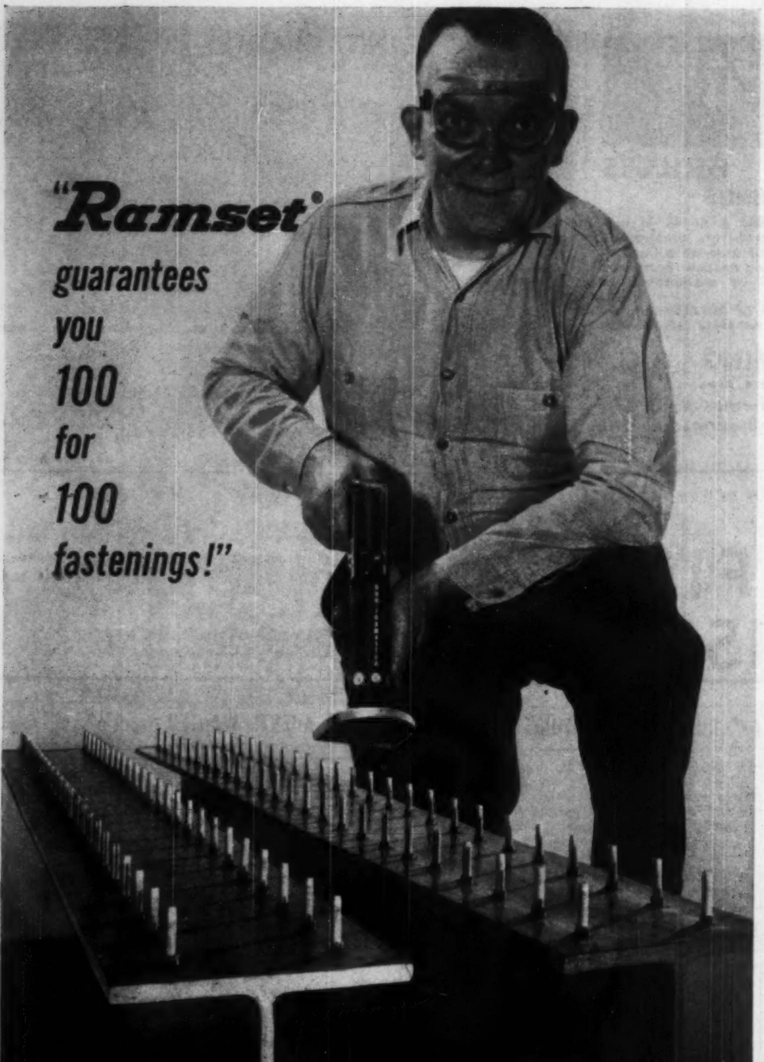

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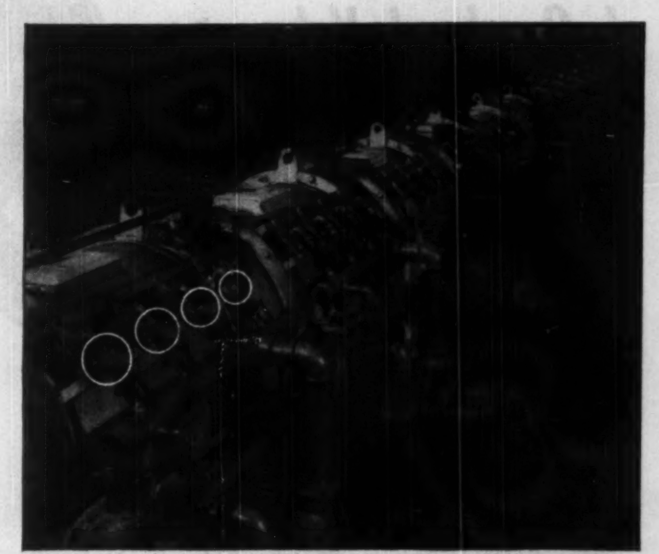

1

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When piping on this huge industrial furnace manifold is removed for periodic cleaning of burners, down time is cut to a minimum. A few turns of a wrench disengages each of the over 100 Dresser Style 65 Couplings. They are easily reinstalled.

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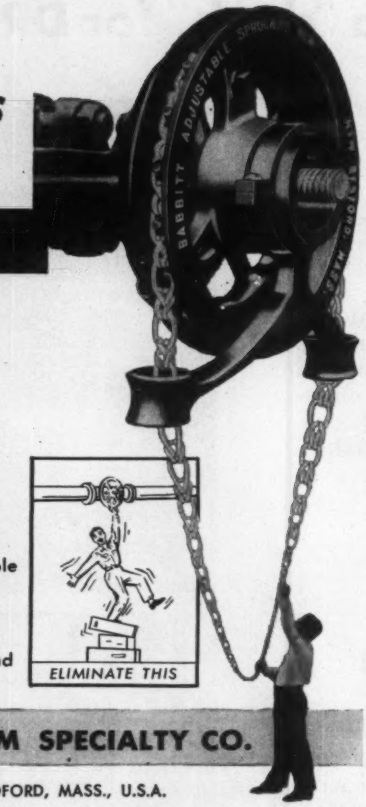

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SPROCKET RIM
with Chain Guide

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Heating, Piping & Air Conditioning
6 N. Michigan Ave., Chicago 2, Ill.

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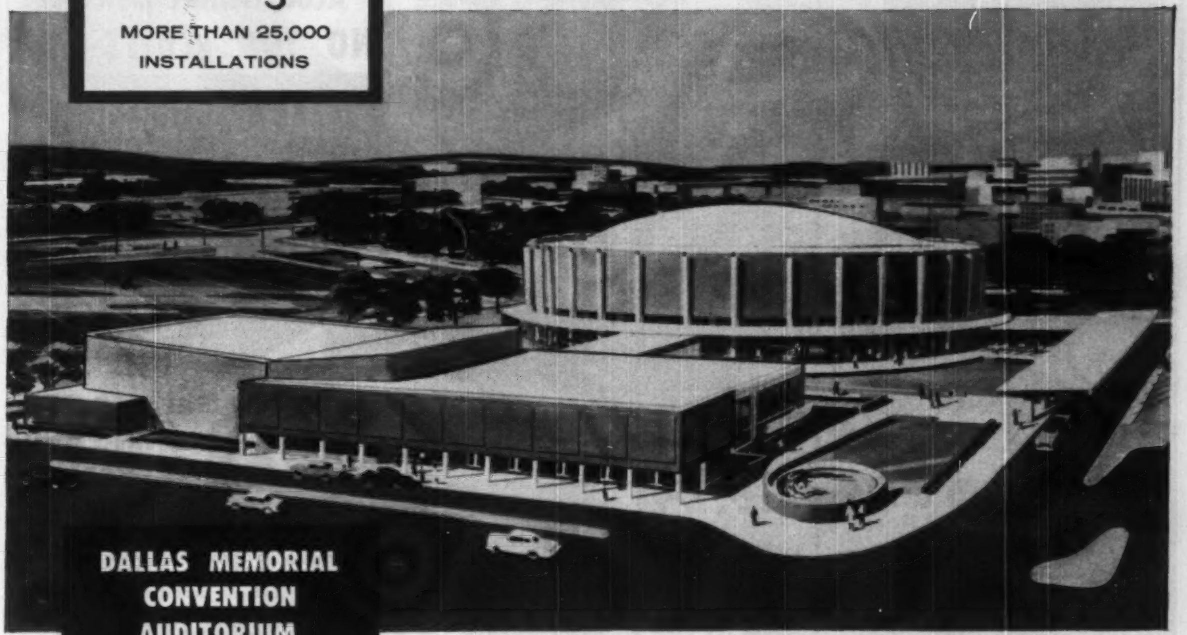

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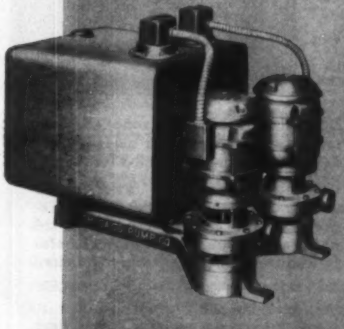

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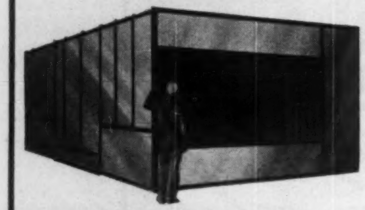

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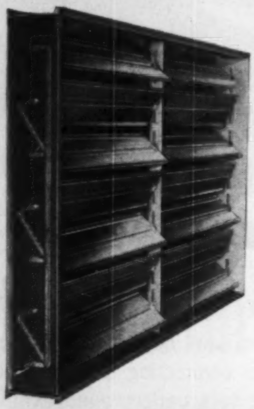

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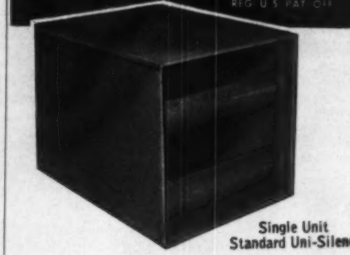

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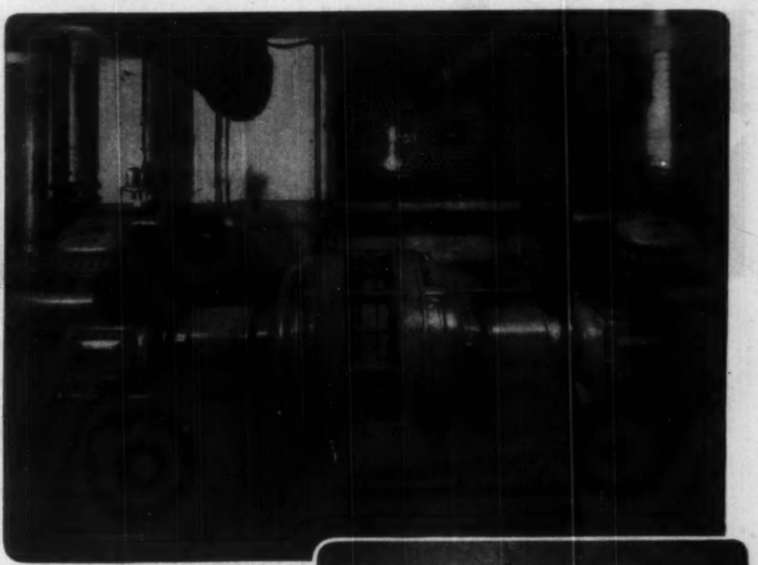

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As this equipment has been in continuous use throughout each year for seventeen years, we feel that it is time for a thorough check, and repairing or replacing of necessary parts.

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If any of your factory personnel is planning on being in this area in the near future, we would appreciate their stopping here and making the inspection. In the event they do, would you advise us as to the date.

Very truly yours,

A. L. Boyd

A. L. Boyd
Eastern District Manager
Office Service Branch

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★ Capacities up to 3500 GPM. Heads up to 340 ft.

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a quiet answer to noisy piping...

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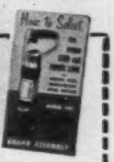

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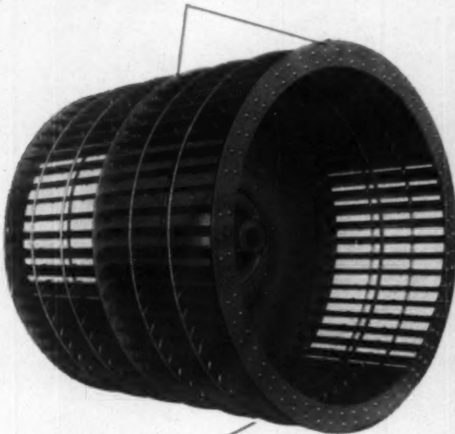

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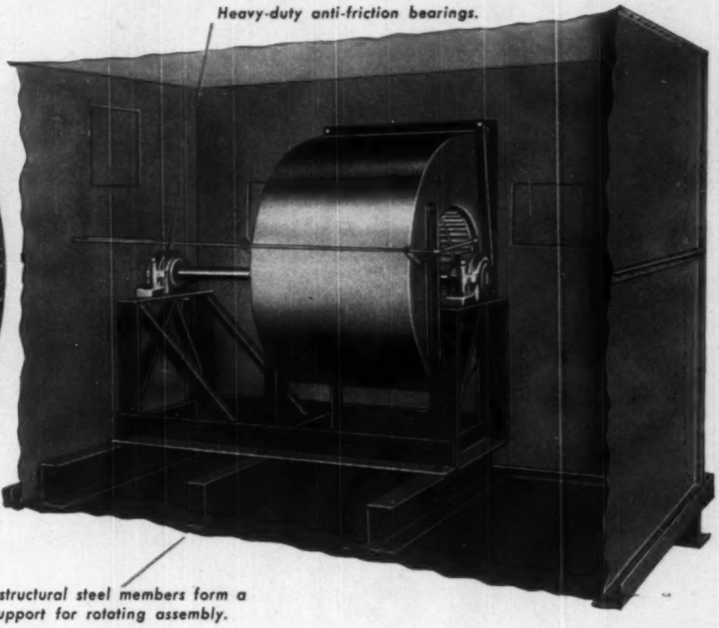

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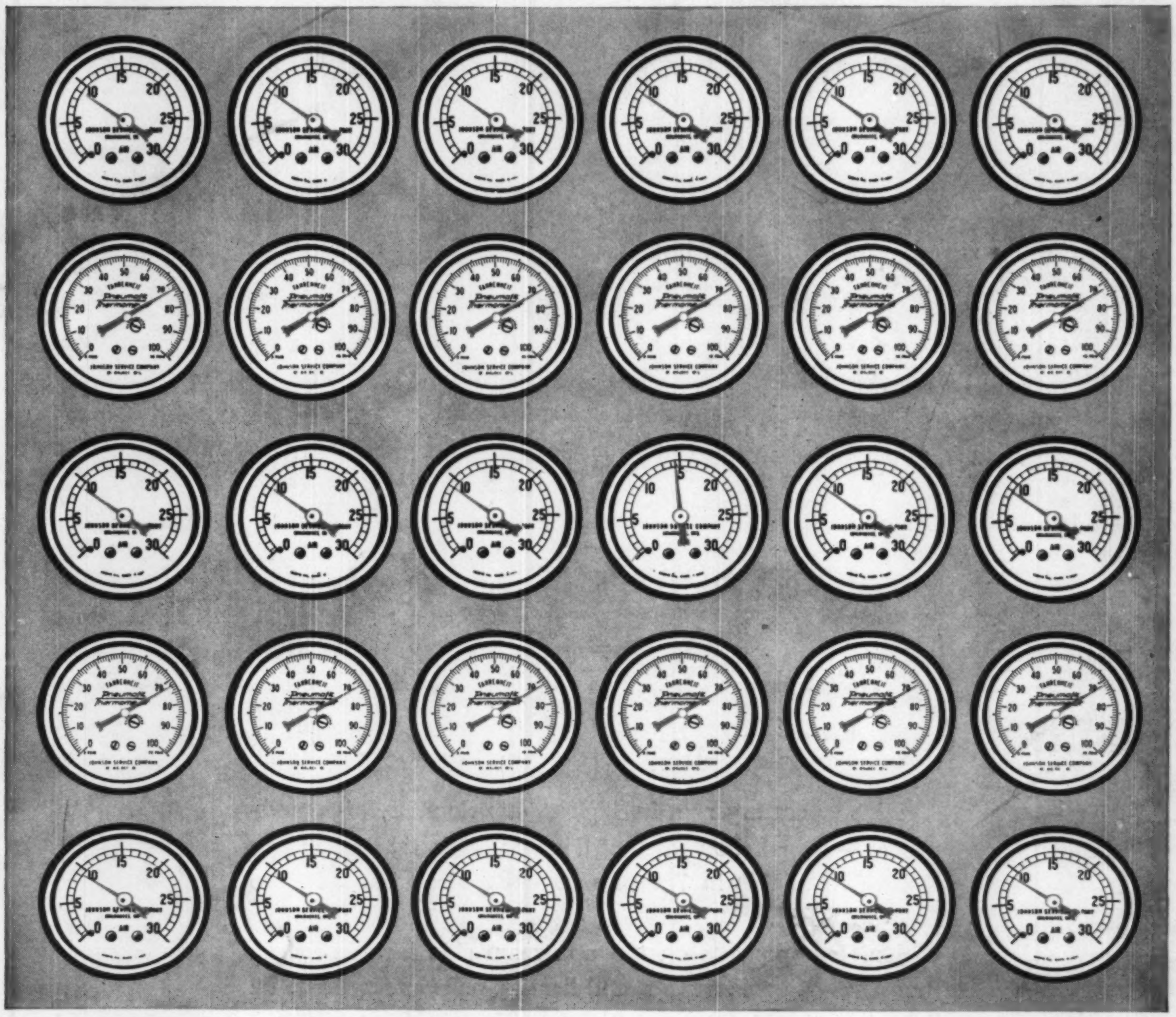

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